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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK, GREAT BRITAIN, NO. 410426

REG. U. S. PAT. OFF.

SEE PAGE 186

This Queer Little Automatic Device
Protects My Car From Thieves
ELECTRICALLY!

I have hit on something truly amazing. Since the first discoveries of radio, I know there has been nothing so startling and uncanny. My little secret device guards every part of your automobile from spare tire to headlights and steering wheel. In your garage or on the street it is on the job 24 hours a day. Never sleeps, rests or gets tired. Already approved by insurance companies and motor associations. Now offered on 5-day test.

Puzzles Everyone!

THIS little, automatic "electric-watchman" invention is called "Devil-Dog." It is not only a new kind of device, it is an *entirely new idea!* Absolutely unique and utterly different than anything anyone ever saw before. So startling that it grips the imagination of everyone from the millionaire Rolls-Royce owner to the fellow who drives a second-hand Ford. Until he knows the secret every motorist will swear that you have someone hiding in your car. He just simply can't *believe* there can be such a device as this queer "electrical-watchman."

INSTALLED IN 10 MINUTES — COSTS NOTHING TO OPERATE

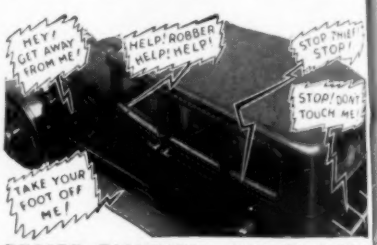
Every man who owns a car can afford Devil-Dog. Actually, no man who owns a car can afford to be *without* this inexpensive protection. Last year over 116,000 automobiles were stolen in this country. Millions of dollars' worth of spare parts were pilfered by sneak thieves. Now Devil-Dog can be installed by anyone in ten minutes or less. There is absolutely no cost for operation. No extra batteries to buy. It will last as long as the car. And you hide the secret switch button anywhere you want to around your car. It's nothing but common sense for a man to grab Devil-Dog the very first time he sees it demonstrated. No wonder distributors already are cleaning up young fortunes!

5-DAY FREE TEST

I invite readers of this magazine to send for the special 5-day test offer now being made on Devil-Dog. Test it. Show your friends. If your present income is less than about $50 a week, profit opportunities as my spare-time or full-time representative may surprise you. My one condition is, I want men to help me *quick!* Write me today!

AUTOMATIC DEVIL DOG

NORTHWEST ELECTRIC CORP.
Dept. B-10, Pukwana, So. Dak.



RECORD EARNINGS — $138 IN A DAY!

Every Devil-Dog sale brings you a real profit. No penny-ante little business! That's another reason Devil-Dog is a *real* big money maker! G. Oliver, Illinois representative, reports, "Made $138 in a day. This is the easiest way to make money quick I ever heard of. My next order will be for 1,000." That's the top record so far. Who will beat it first?

POLICE BUY FOR ARMORED CAR

Richard Jacques, Canada, just started, writes, "Here's our order for 24 Devil-Dogs. I have sold one to the police for their armored car. Am also getting letters from the Chief of Police and the Detective Department. Tomorrow we demonstrate to the motor league."

Northwest Electric Corp., Dept. B-10, Pukwana, So. Dak.

Rush territory details and your 5-day test offer without obligation.

Name.....

Address.....

Town.....State.....

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Turning on water faucets *pours Money into your hands*

Why drink dirty, germ laden water?

Here, at last, is an amazing water filter that attaches to the faucet and removes instantly the germ laden dirt from drinking water. Housewives everywhere want this Filter the minute they see it. It is a health protection that is needed and should be in every home.

Scientists have proven that water filtration prevents such diseases as Erysipelas, Septicaemia and Diarrhea and actually lowers the death rate from Typhoid Fever. It is a proven fact that in many communities the water that comes from the drinking faucet is laden with disease germs.

Why continue to take chances with disease and death-why be subjected to danger and possible sickness by drinking raw, unfiltered water?

Dirty drinking water is a thing of the past the minute an Automatic Water Filter is installed. Saves buying expensive spring water. Now clear, clean water is within the reach of all.

AGENTS

If you are earning less than $3.00 an hour and would like to make up to $100 a week and even more, clip and mail the coupon today. The Automatic Water Filter offers quick sales and big profits. Every housewife in your territory is waiting for this health protector.

Sample Free to Workers

We have arranged a plan that makes it possible for agents to start immediately making big money with the Automatic Water Filter. Good paying territory is open. Our plan enables those who are really interested to obtain their sample for nothing. Mail coupon today for Free Offer Plan.

New invention purifies water instantly ... at the faucet!

Just imagine a device that purifies water instantly at the faucet and yet can be attached in a few seconds! Think of it—You can put on an Automatic Filter, let the water run for ten minutes, remove the filter and find enough dirt and filth to fill the bottom of a glass. When you see what this Filter does you will not want to be without it. It delivers pure, sparkling water, clear as crystal and free from germ laden filth.

FILTERS LIKE NATURE

It is just like bringing a bubbling spring into your kitchen. The principle of the Automatic Filter is just like nature. It forces the water thru crystal silica sand. The dirt and germs cannot pass thru the sand so the water that comes out of the faucet is clean, free from impurities, pleasing to the taste, and healthful to the body. Crystal Spring Water could be no more pure or healthful than the water that comes out of the Automatic Water Filter. It also prevents splashing.

Guarantee

It makes no difference where you live, or what kind of drinking water you have, the Automatic Water Filter will remove dirt and filth from it. We guarantee it to purify water, remove dirt and filth, protect against contamination and deliver pure crystal clear, sparkling water, or the trial costs you nothing.

AUTOMATIC WATER FILTER CO.
MILWAUKEE WISCONSIN

MAIL THIS COUPON TODAY

Automatic Water Filter Co.,
Dept. 142, 2621 N. 3rd St., Milwaukee, Wisc.

Gentlemen:—You may send me full particulars of your free offer and big money-making proposition.

Name.....

Address.....

City.....State.....

An Aerial View of the Downtown Section of New York City a Few Minutes after Airplanes, Engaged in Mimic Warfare, Have Laid Down a Gas Attack; the Vapor through Which the Towers Peep Represents the Gas Which, if Deadly, Might Destroy Thousands in a Few Minutes

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The Clouds of Death

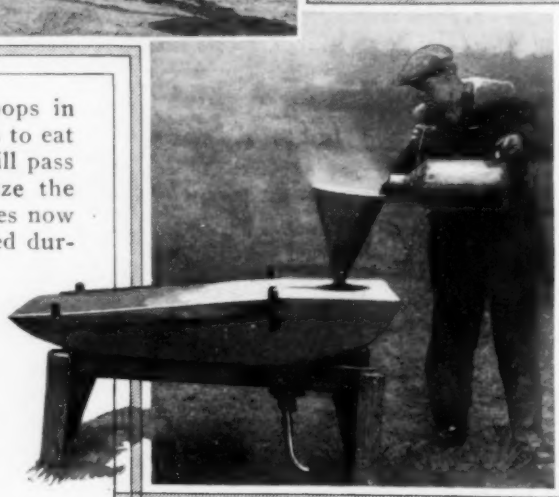
Bombing Planes Beginning a Mimic Gas Attack on New York City; These Big Ships Are Just Starting the Smoke Curtain over the Water, Preparatory to Flying over the City Itself

By CORLEY McDARMENT

UNHERALDED and in silence, military men of all the civilized countries are closely watching the chemical laboratories for new agents of destruction.

At all peace conventions, the diplomats descry the use of gas in future warfare, but everybody in position to know about these matters realizes that gas will undoubtedly be employed in the next war. Some experts go so far as to assert that the next war will be nearly all gas.

The first use of gas in modern times, which was during the World War, was looked upon with horror. But all new weapons have survived because they were effective.



Gas is certainly effective. It makes soldiers fight in masks. It puts a vast number of men out of battle for weeks or months, and yet it kills very few when defensive measures are used.

It has been predicted that the next war may be won by the side that develops the use of a gas which will penetrate the masks worn by the troops in the field. This does not mean a gas to eat holes in the masks, but one that will pass through the filters which neutralize the known gases. There are many gases now which will penetrate the masks used during the last war.

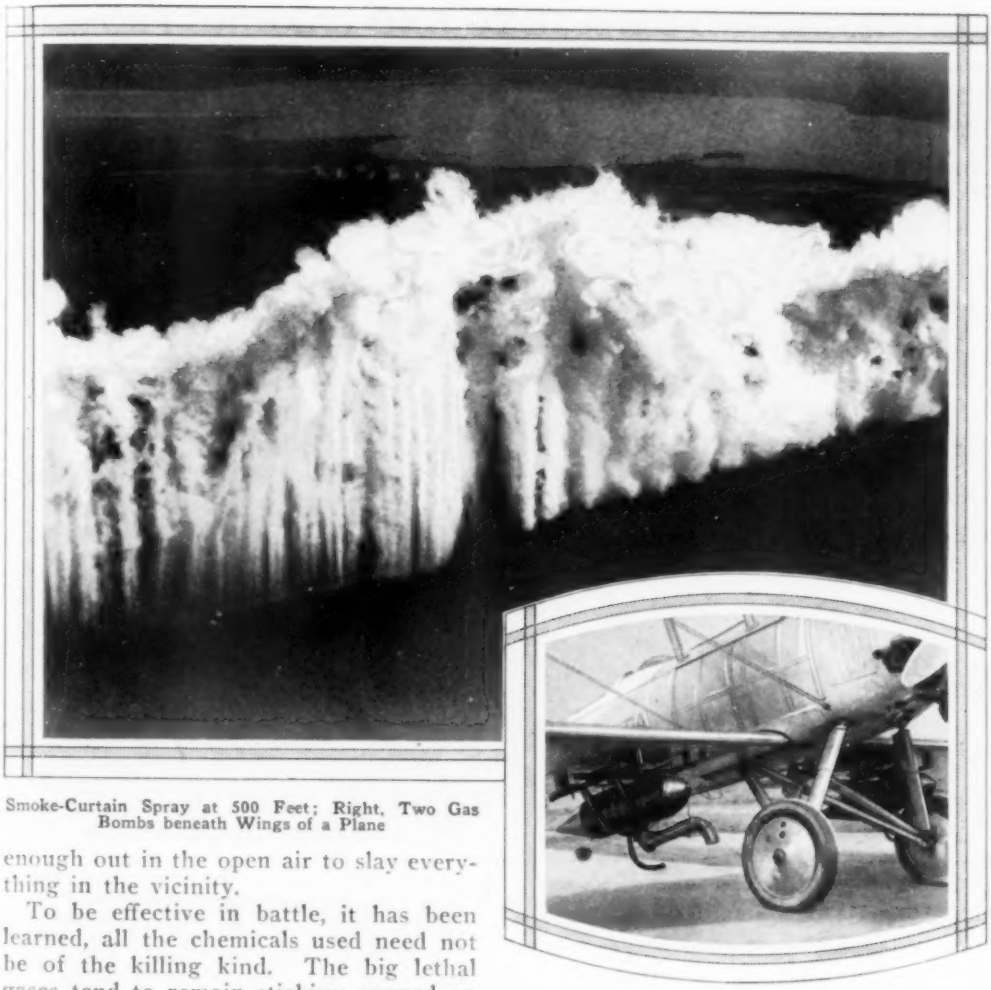
One of the recent developments in this gas warfare is the use of a gas which will seep under a mask and cause sneezing, or vomiting and force the soldier to remove the mask in the presence of other gas which strangles or paralyzes.

A new gas developed since the war has the long chemical name of "chlorovinyldichloroarsine." But it is commonly called "Dew of Death." Three drops of this gas in liquid form on the skin of a rat will cause death within one to three hours. An amount of the liquid of this gas as small as a half inch in diameter splashed upon the bare skin of a man will kill him.

And then there is another chemical plaything which may be used in another war, called hydrocyanic acid. This was known during the World War, but was not used because no effective way had been developed to get good ground concentration. The airplane, however, can carry it very well. This is the quickest poison that chemical warfare has at hand in large quantities—or rather that may be obtained in quantity. This acid paralyzes the nervous system and quick death follows.

The killing gases, however, are not so bad as one may think. They are not gentle creatures by any means, but where soldiers are prepared for poison gas, very few get deadly doses. It is no easy matter to get a concentration of poison gas thick

Top, German Civilians Wearing Gas Masks; Center, Gas Tank of Pursuit Plane; Below, Filling Smoke-Screen Apparatus



Smoke-Curtain Spray at 500 Feet; Right, Two Gas Bombs beneath Wings of a Plane

enough out in the open air to slay everything in the vicinity.

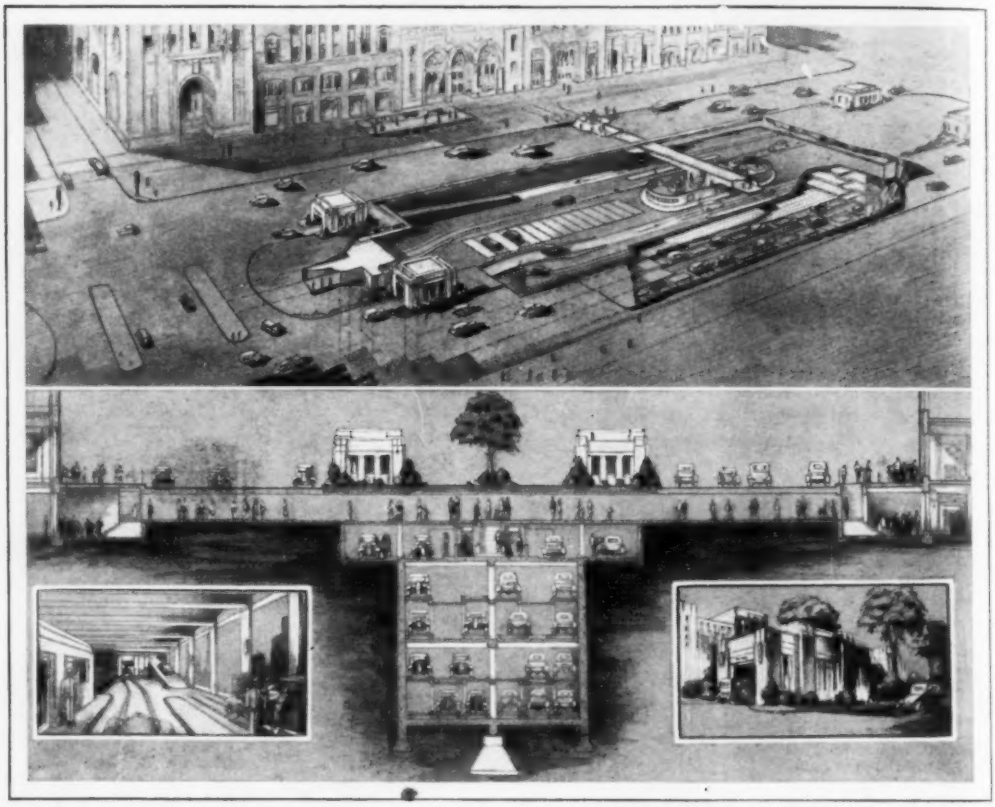
To be effective in battle, it has been learned, all the chemicals used need not be of the killing kind. The big lethal gases tend to remain sticking around on objects for some time and this is not always desired. Such gas action renders a position untenable for both friend and enemy. On account of this effect, much has been done lately in developing tear gases and containers. A tear gas that will sneak into a regular gas mask would win a war, according the best experts. A soldier absolutely cannot fight, nor even see, while exposed to tear gas, and his position and arms may be taken without a struggle. This is far more humane than blasting his arms and legs off with guns or sprinkling him with deadly gases and acids.

But there has been developed still another gas, one which acts upon metals. This gas was used to some extent during the war against personnel, but its effectiveness against the metal of guns was not then appreciated. It corrodes the working parts of a machine gun so that, overnight, it may be made useless.

With airplanes as gas carriers, an attack may be launched at almost any time, day or night. Gas containers which fit underneath an airplane may be hooked up within a few minutes. Thus the heavy and dangerous gases may be carried low over the heads of enemy positions and deposited with telling effect. Even liquid fire may be used to break up machine-gun nests. It has been predicted that asbestos clothing will be necessary in the next war.

¶Pearl piano keys now can be obtained to replace worn ivory parts.

UNDERGROUND GARAGE TO END PARKING PROBLEM



Drawings Showing Details of Plan for Underground Garages to Solve Parking Problems in Congested Areas; Elevators and Electric Conveyors for Cars Are Included in Design

To solve parking problems in congested city business districts, a system of mechanically operated garages has been designed to be constructed under the streets where the shopper who wishes to store his car for only a short time will always find a convenient place to park at moderate cost. Except for the underground feature, the mechanical garage would operate somewhat like the skyscraper garage that is already in existence. From a street-level entrance, the patron would proceed down a ramp to the first level, or reception floor, where he would receive a parking receipt and depart. A conveyor would carry the car to an elevator which in turn would lower it to a parking floor to be discharged mechanically to an electrically operated transfer truck running on rails. This transfer truck, with the car on it, would travel to a parking stall selected by an attendant by remote electric control, and the truck would be shifted sideways into the parking space.

CREATING LIFE IN TEST TUBE STILL DREAM OF SCIENCE

Can man create life from inert matter? The question is almost as old as the dreams of the alchemists who sought to make gold out of baser metals. The answer, to date, is in the negative, for every attempt has failed although sensational results have been obtained. The most recent report that life had actually been formed from ashes and chemicals in a test tube by Dr. George W. Crile, noted surgeon of Cleveland, Ohio, was met with the prompt reply from Doctor Crile that, while he had been conducting such experiments, he was as yet unable to tell whether they would be a success or failure, and that the search into the unknown

was still far from finished. In 1911, H. C. Bastain startled the scientific world by producing what appeared to be living matter in glass tubes from non-living materials. More recently, Dr. D. T. MacDougal and Dr. Vladimir Moravek, noted physiologists, "created" an artificial cell that displayed many of the characteristics of life and twenty-five years ago Dr. Jacques Loeb succeeded in causing unfertilized eggs to develop by treating them with chemicals. His experiments have since been repeated many times, but there was no real creation in any sense as a living egg was used from the first.

MACHINE WEARS OUT CARPETS TO TEST THEIR QUALITY

Wearing qualities of various kinds of carpet are determined by a tester at the bureau of standards. A sample is tacked on a turntable which revolves under two wheels that bear down on the carpet with pressures corresponding to the weights of different persons. The pressure can be varied and, in operating the machine, the carpet receives a twisting motion and horizontal stress, the combined strains being closely equivalent to what the sample would receive in actual service. Changes

© U. & U.
Machine Employed by the Bureau of Standards to Test the Wearing Qualities of Carpets

in the thickness of the piece are measured with a sensitive gauge.

MUSIC IS CHANGED INTO COLOR AND MADE VISIBLE

Combination of Radio and Electric Apparatus Which Transforms Music into Visible Colors

After a year of experiment, a radio-research engineer has succeeded in making an apparatus intended to transform music and voices into visible colors. The machine which translates tones into colors consists of an intricate array of radio and electrical connections and a hooded black box in which the tones are "seen."

PRESSURE OF GAS IN TREES IS MEASURED

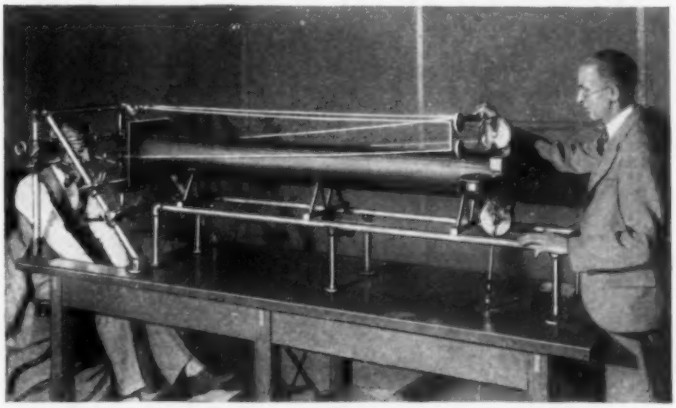
For the purpose of studying the relation existing between the internal structure of woods and gas pressure, an instructor in the department of forestry at the University of Minnesota has made an apparatus to determine the internal gas pressure of trees. It consists of a brass plate with a rubber gasket which, when fastened to the smooth part of a tree, reduces pressure to such an extent that a hole may be bored and a tube inserted. By forcing the tube into the tree trunk about three inches and closing the outer end with a stopcock, gases are extracted and internal pressure measured by fluctuations in a column of mercury connected to the tap. To collect the gases for analysis, a vacuum tube is inserted instead of the mercury tube. The percentages of gases and conditions affecting them thus are obtained.

© Chicago Aerial Survey

Photo-Diagram Showing Location and Part of the Buildings as Proposed for the Chicago World's Fair Centennial Celebration in 1933; the Fair Structures, Decidedly Modern in Design, Are Augmented by the Field Museum of Natural History, the Soldiers' Field and Other Buildings Already Constructed

INAUDIBLE SOUNDS TO AID DEAF

Radio principles are being applied as aids to the hard of hearing through the use of sound waves pitched so high as to be inaudible to persons with normal ears. Heretofore most appliances to aid the partly deaf have depended on some form of sound amplification. Research engineers, however, observed that the hard of hearing seemed to hear much better in a subway or other place where there was a constant noise or roar. They decided this was due to the fact that this noise kept the eardrums in vibration and that the vibrating drums were more sensitive to sound than when set in motion from a state of rest. In order not to annoy normal persons, a method was developed for sending out sound waves of a frequency beyond the range of the ear. These waves are not heard, but keep the eardrums vibrating, thus making it easier for the partly deaf to pick up audible sounds. A radio oscillator is used to create the inaudible pitch and a reed operated by compressed air to supply body or volume and frequency.



Apparatus Which Makes a Movie Record of Eye Movements When Reading; It Is Used to Help Correct Faulty Reading Habits

FAULTS IN READING REVEALED BY MOVIES OF EYES

Motion-picture records of a person's eye movements while reading are made with an apparatus at the University of Minnesota which is intended to detect faulty reading habits. A tiny broken beam of light, flickering fifty times a second, is reflected into the subject's eyes by means of small mirrors. The reflection on the surface of the eye changes direction as the eye moves back and forth in reading. This eye movement is magnified five times by an enlarging camera, and then recorded on standard-size movie film. As the subject reads, the eyes move along the line in an irregular manner, making several pauses, then sweeping back to the beginning of the next line. These jerky movements are recorded as a series of tiny dots on the film. Thus the film may be studied to note defects in the ability to read rapidly without pausing too long on any word or letter, or rereading a passage. No reading is done while the eye is moving, but only when it is held still, and in silent reading the normal person makes an average of five pauses per line.

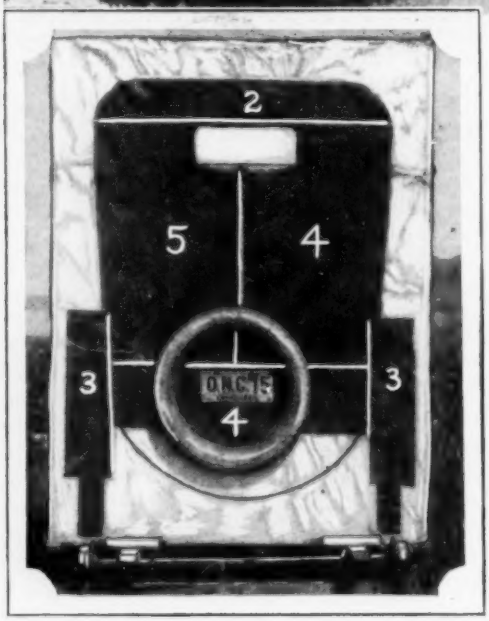
GOLF-PRACTICE CAGE SHOWS DRIVES AND HAZARDS

Among the many kinds of golf-practice cages on the market, one is intended to afford more of the thrills of the real game, as it registers strokes that go into the rough, into bunkers or water hazards, as well as the length of the drives that stay on the fairway. After each stroke, the cage can be cleared for the next shot by pressing a button. The apparatus is sturdily built.

Golf-Practice Cage Which Registers Length of Drive, and Strokes That Go into the Rough

Photo-Diagram Showing Location and Part of the Buildings as Proposed for the Chicago World's Fair Centennial Celebration in 1933; the Fair Structures, Decidedly Modern in Design, Are Augmented by the Field Museum of Natural History, the Soldiers' Field and Other Buildings Already Constructed

SPEEDING AUTO TARGET AIDS POLICE CRIME WAR



Firing at the Target from Moving Car, and Close View of the Target, Showing Scoring Zones

To help police develop accurate aim with submachine guns in their battles with fleeing bandits, an Omaha man has devised a moving target which represents a speeding automobile. It runs on a track and is operated by a motor. Police, riding in a real automobile some distance away, open fire with their machine guns as the target moves. Their shots are scored according to probable results were the target a real automobile carrying bandits. For instance, shots striking the back of the target in such a position that they would have hit the driver, are given a count of five. A hit that would have struck the driver's companion on the seat beside him counts four, tire shots count three and to hit the top scores two. Puncturing the gasoline tank would also count four. Since the police car can be driven past the target at different angles and different speeds, the shooting practice is considered especially helpful.

PULL OF GRAVITY MEASURED WITH BALLS OF GOLD

What is said to be the most accurate measurement ever made of the constant of gravitation, a basis for computing the mass of the earth, the force with which the earth pulls the moon and other phenomena, has just been completed by Dr. Paul R. Heyl, of the bureau of standards, after seven years' work. Similar measurements have been made before, but Doctor Heyl's figure, in view of the special apparatus with which he worked and the numerous checks and rechecks he made, is considered to be the most nearly correct of any. A method, essentially like that followed at the close of the eighteenth century by Henry Cavendish, an English physicist, was used by Doctor Heyl who swung tiny balls of gold, platinum and glass at varying distances from large steel cylinders, weighing about 150 pounds each, and carefully measured the attraction exerted

by the big units upon the tiny balls. Although the force was exceedingly small, Doctor Heyl was able to measure it with an accuracy of approximately one-thirtieth of one per cent.

ELECTRIC EYE IS ROBOT GUARD FOR WRAPPING MACHINE

As automatic machinery grows more precise, its accuracy and speed surpass human perception, particularly when operations are performed at the rate of more than sixty a minute. Therefore one machine is being placed as a vigilant watchman over the operations of another automatic machine to prevent errors and correct improper adjustments. This plan was evolved recently when machines that wrap packages in waxed paper developed errors, which wasted paper and resulted in unattractive cartons. The robot watchman is an electric eye, or photo-electric cell, actuated by variations in the intensity of light beams. Small printed spots were placed on the waxed paper and an electric light below the paper roll caused these spots to cast shadows on the photo-electric cell. These interruptions of light are converted into electric impulses amplified to operate power relays which gear the feeding unit and cause it to operate at proper speed. Through a variable-speed transmission, the electric eye also regulates the machines when the paper slips, slowing them down or speeding them up, as required. In this manner seventy-two packages are wrapped each minute, and the cut of paper is kept correct within one-sixteenth of an inch.

The Light Shown Is Part of the Electric-Eye Apparatus That Watches over Work of This Machine

Ejecting Golf Ball from Cup by Touching Button in Bottom; Ball Bounces into Hand

GOLF BALL EJECTED FROM CUP TO SAVE STOOPING

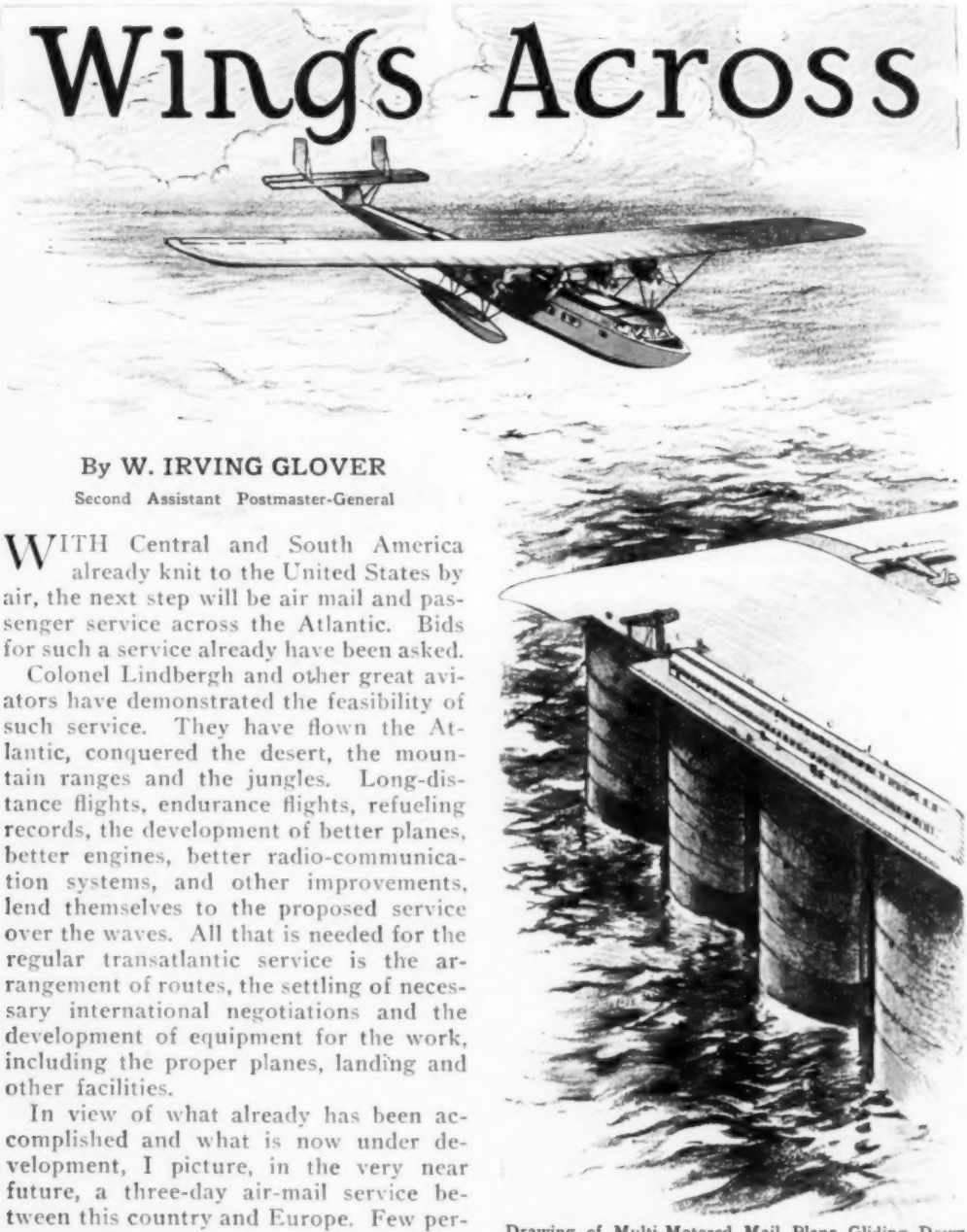
Golfers are saved the necessity of groping about in cups after sinking a ball by an ejector which snaps the ball out of the cup and three feet into the air, where the player may catch it without stooping. The cup is equipped with a small mechanical device which does the ejecting. When the ball falls in the hole, it always takes a certain position. The player then inverts his putter and places the handle in contact with a rubber button which causes a hammer to throw the ball out.

PLANTS FOUND MORE SENSITIVE THAN CHEMICAL APPARATUS

Certain seaweeds, known as kelps, are more sensitive mediums in the test for iodine than any chemical known. These weeds have been found to give evidence of the presence of iodine when taken from waters that show no trace whatever of the element when analyzed by chemical means. It has been established by research that these plants are able to accumulate iodine in water which ordinary tests show is entirely free of it.

¶ Moving advertising cards are being installed in taxicabs.

Wings Across



By W. IRVING GLOVER

Second Assistant Postmaster-General

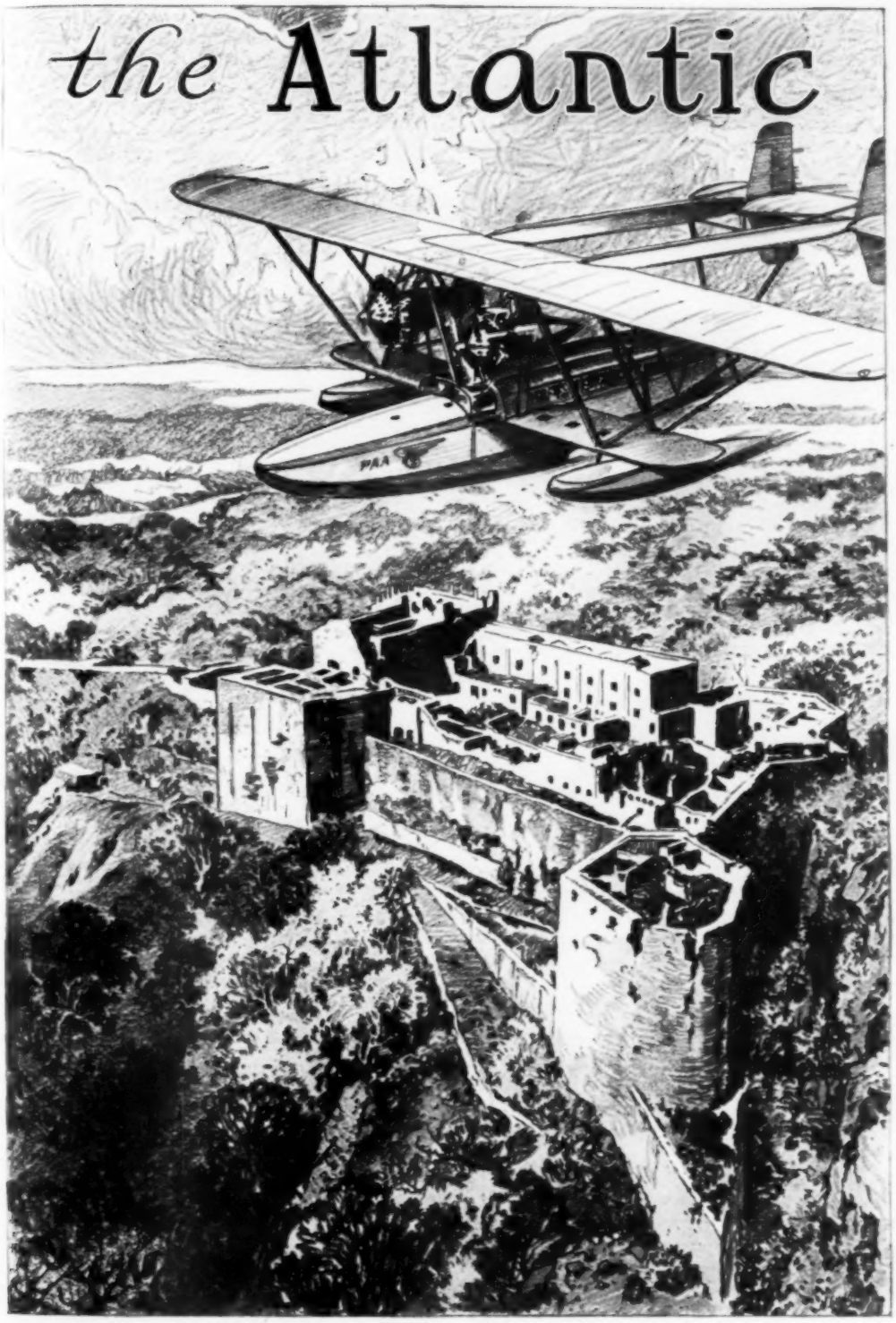
WITH Central and South America already knit to the United States by air, the next step will be air mail and passenger service across the Atlantic. Bids for such a service already have been asked.

Colonel Lindbergh and other great aviators have demonstrated the feasibility of such service. They have flown the Atlantic, conquered the desert, the mountain ranges and the jungles. Long-distance flights, endurance flights, refueling records, the development of better planes, better engines, better radio-communication systems, and other improvements, lend themselves to the proposed service over the waves. All that is needed for the regular transatlantic service is the arrangement of routes, the settling of necessary international negotiations and the development of equipment for the work, including the proper planes, landing and other facilities.

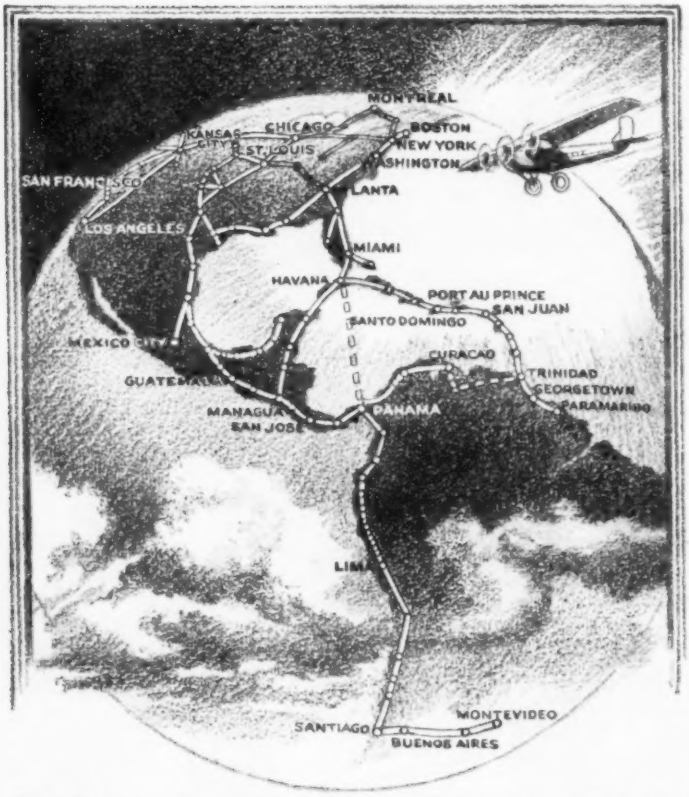
In view of what already has been accomplished and what is now under development, I picture, in the very near future, a three-day air-mail service between this country and Europe. Few persons realize it, but a transatlantic air-mail route already is in operation and has been for about two years. French planes fly from Toulouse down the Spanish and African coasts to Natal, Brazil, using as a way station an anchored vessel several hundred miles from the South American coast. There the planes can be refueled and repaired if necessary. The ship breaks a long water hop, promoting greater ease and safety.

Drawing of Multi-Motored Mail Plane Gliding Down to a Landing on a Seadrome

Details of the service between Europe and the United States remain to be worked out, but a feasible arrangement would be something like this: Base ports in this country would be New York, Baltimore



Planes of the Pan-American Air Lines Now Wing Their Way over Famous Castles, the Jungles of Mexico and Distant South American Countries



Since This Map of Pan-American Lines Was Drawn, Service Has Been Extended to Southern Limit on East Coast of South America

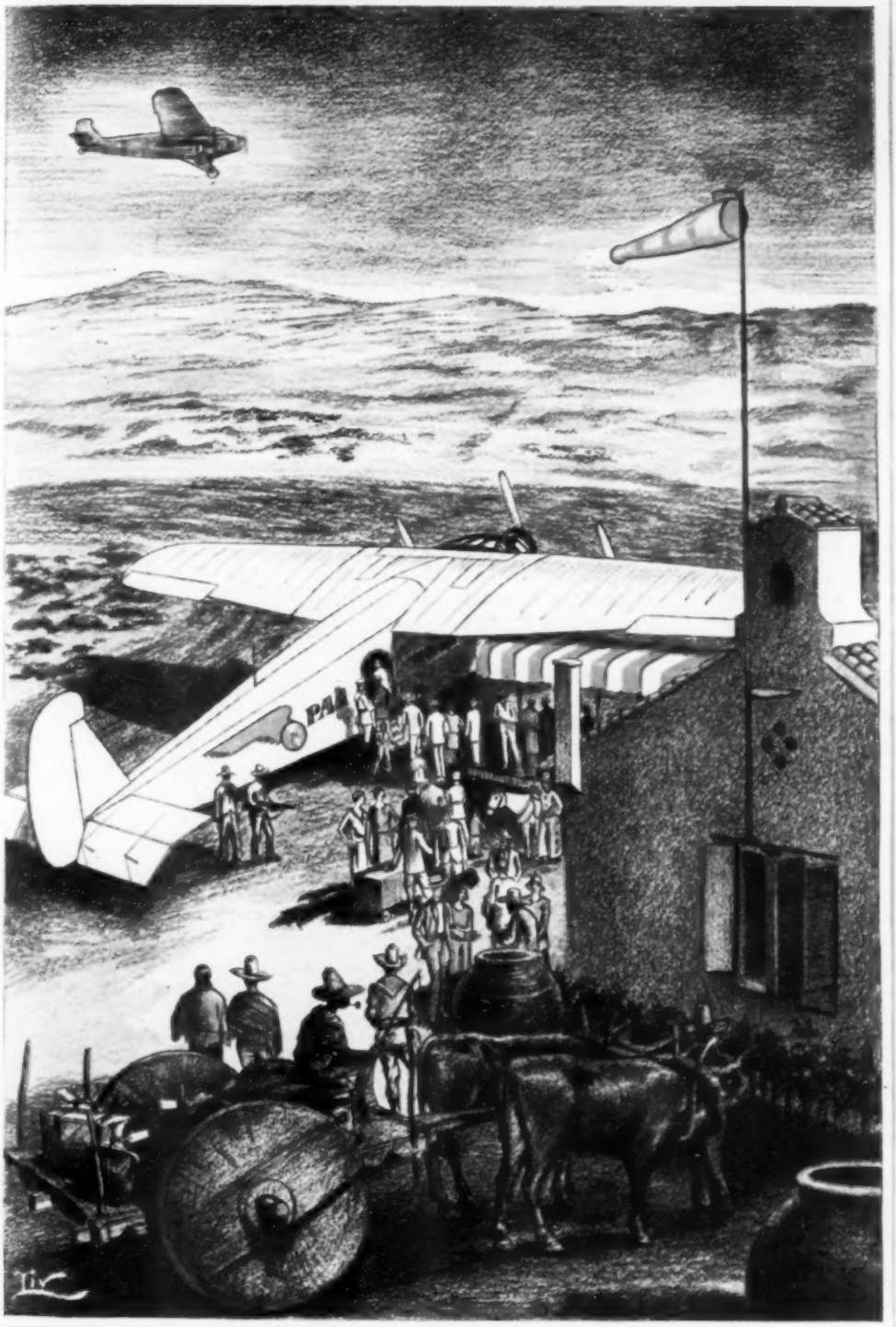
and Charleston, S. C. Planes would leave the latter point for the journey across the Atlantic. The southern way, of course, is longer than the usual passage by way of Newfoundland, but the northern route, repeated flights have proved, is usually stormy and shrouded by fogs much of the time. Weather conditions are generally favorable most of the year by the proposed southern way.

Way points across the Atlantic would be established at Bermuda and the Azores. The long-distance water hops could be broken up by intermediate stations established on "floating islands." Some persons have smiled at the prophecies of inventors who are interested in projects of this sort, but we have learned not to smile too soon. So swift has been progress in aviation that it ill behooves the thinking person to laugh at such proposals. Whether the suggested floating islands will have hotel, swimming-pool and miniature-golf facilities for patrons who desire to stay awhile, remains to be seen, but the essential idea of a man-made island in the form of an anchored or confined floating landing field suitable for planes to alight upon and to be serviced or repaired, is essentially sound and will probably be realized.

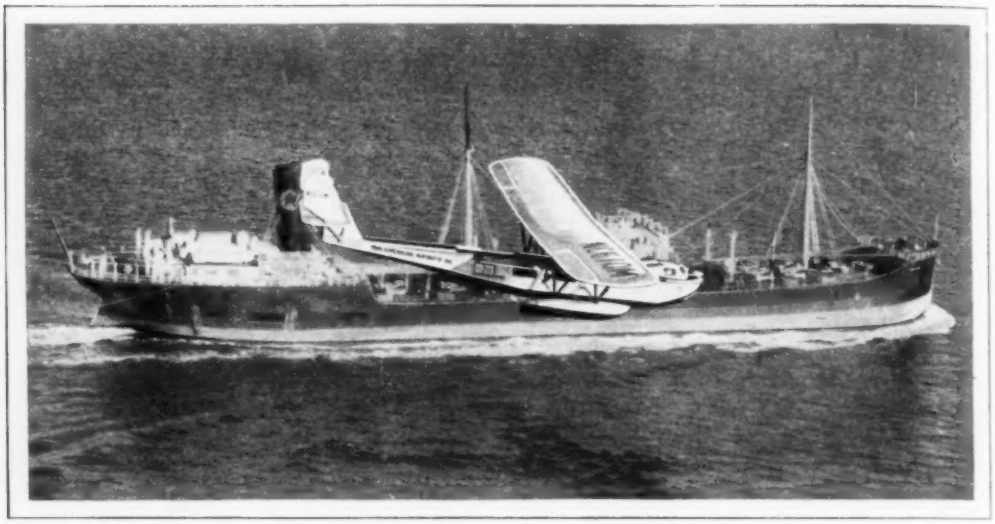
One solution of this problem, an economical and practical one, I believe would be to use vessels already constructed and now owned by the shipping board. They could be purchased, perhaps for as little as $50,000 apiece. It would be necessary to construct wide decks for landing facilities, but there would not be the expense of elaborate hoisting and propelling machinery essential to the usual airplane carrier. These vessels, equipped with radio-transmitting and receiving apparatus, could be sent out into the Atlantic, stationed at strategic intervals along the proposed route and kept constantly in service as emergency landing and guiding ports for the aid of the planes.

Enough vessels of this kind could be purchased and fitted to form a virtual chain between the mainland, the intermediate islands and the European coast, so that the air route would be marked and serviced with emergency fields just as the present air routes over land are equipped. The vessels could carry, besides their radio and other equipment, powerful beacons for the guidance of night flyers. Their presence in the Atlantic would also be of help to other vessels. The entire fleet of them could be bought and made ready for such service at a total cost well within the realm of practicability.

One of the chief obstacles to long-distance flights has been encountered, not in the actual flight itself, but in getting into



Drawing of Scene at a Cuban Airport Where Modern and Ancient Forms of Transportation Meet in One of the Most Striking Contrasts of the Age



Pan American "Commodore" Plane Passing a Steamer during a Test Many Miles from Shore; Flying Boats like This Speed over Water Hops of 1,000 Miles and More

the air at the start. The plane is loaded with its necessary pay burden, that is, the mail, express or passengers that it must carry; then, in addition to this, it carries a great quantity of gasoline and oil. It is loaded to absolute capacity. The take-off is often a hazardous and trying affair, straining men and equipment to the limit and often wrecking the hopes of the expedition at the very start.

A solution of this problem could be worked out in a plan for refueling. The ship would be loaded with its pay load and enough gasoline and oil to take it, say 100 miles out. After it had ascended safely into the air and was well under way, it would be met by a service plane and refueled or rather given its full load of fuel from the air, thus saving the tremendous task of taking off with the huge burden of a full pay load and a maximum amount of fuel.

A thorough and dependable radio-beacon and communication service would be installed for the constant guidance of all planes along the way. In case the floating islands had drifted from their set position, the fact would instantly be relayed to the pilots, and little difficulty would be experienced in establishing contacts. The vessels could easily be turned to favorable positions for landing, regardless of the direction of the wind; the hazards of fog and storms are continually being minimized by the development of better radio systems, improved planes and engines and more skilled pilots. The over-water hops now accomplished in the Pan-American service prove that planes, as now equipped, are capable of long-distance flights in safety. We could start a trans-atlantic air-mail service tomorrow with the equipment already available, but much more complete and efficient accouterments are rapidly being devised so that, when the service actually goes into effect, no detail will have been overlooked as to safety, speed, economy and comfort for pilots and passengers as well, for the mail planes will also carry people, and a hop to Europe through the air will be a matter of hours instead of days.

We have seen enough of the results of the establishment of air routes to Central and South America, and of the results of the few hops that have been made between America and Europe, to visualize what this regular service will mean in the promotion of international good will and friendliness. After all, the factors that hold the nations apart are largely geographical. When these barriers are literally swept aside as they are being eliminated through the use of the airplane, a large step will have been taken toward the cultivation of world unity of feeling. Geographical nearness is one of the important reasons for the unity of the

United States. Friendliness with Canada and Mexico is being promoted because the invisible line between us and those nations is now even more invisible, due to aviation.

Air mail to Europe will cut cable expenses, quicken trade, helpfully supplement all other forms of communication now in effect, and will greatly increase the usefulness of the service already established to Central and South America. Man's flights to date prove the feasibility of the project. The necessary equipment, the routes, the personnel and the public co-operation are awaiting call. The post office department, as in the past, is lending its active aid toward the forging of this new link toward international good will.

AIR FOR FIREMEN IS PUMPED FROM HOSE TRUCK

To enable firemen to enter burning buildings without the danger of being overcome by smoke, masks are now provided through which fresh air is pumped from the hose truck. The smoke masks are attached to a small hose connected with the truck pump. Three masks are provided for each line of water hose, enabling three men to enter a burning building with the hose and thus do more effective work. A water trap is provided for the air hose to catch any small amount of water that might be in it when the air is started through. This trap is strapped to the fireman nearest the pumper.

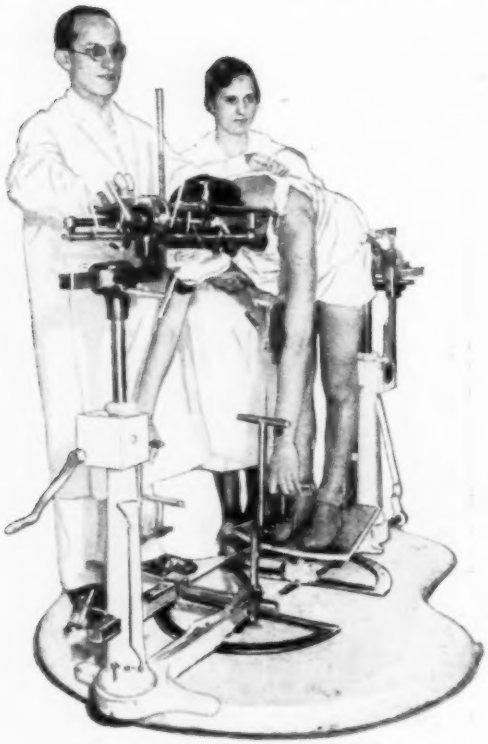
Firemen Equipped with Smoke Masks, Connected to Hose Truck Which Pumps Fresh Air to Them

Big Roller Bearing for Steel-Plate Mill; the Girl Holds a Small Bearing for Comparison

HUGE ROLLER BEARING WEIGHS THREE AND ONE-HALF TONS

Anti-friction bearings during recent years have been growing constantly in size as the machines employing them grew to meet new industrial needs, until recently twenty-eight roller bearings, weighing three and one-half tons each, were produced for a ninety-two-inch plate mill operated by a steel company. These huge bearings are made with the same precision and to the same specifications as the little ones, about two inches in diameter and weighing about seven ounces that are used in automobile wheels. The large bearings, however, have a bore of twenty-nine and one-half inches, an outside diameter of forty-nine and one-half inches and a width of twenty-nine inches, with a load capacity of 8,000,000 pounds at thirty revolutions per minute. One of these big rollers contains enough metal by weight to make thirty-six of the little bearings.

¶Blind persons in Peoria, Ill., carry white canes which, when raised at street intersections, give them the right of way.



Apparatus Installed in a Chicago Hospital for Treating Persons with Curvature of Spine

CURVATURE OF SPINE TREATED BY INTRICATE MACHINE

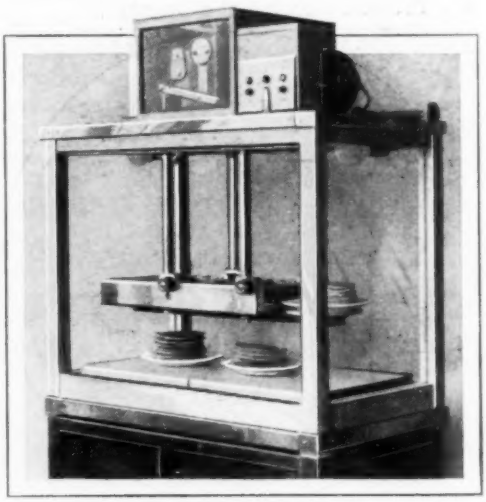
Curvature of the spine now is being treated by a product of the machine age. A doctor in Italy has developed an intricate apparatus for helping persons with this ailment, one of the machines having been installed recently in a Chicago hospital. The patient is seated on the machine with body bent forward, much as though straddling a horse, and the appliance is then manipulated to cause the desired effects.

CARBURETOR LIFTS OWN FUEL SAVING GASOLINE PUMP

Vacuum tanks, fuel pumps and other lifting devices are unnecessary with an improved carburation system for gasoline engines which takes the fuel directly from the main tank. It consists essentially of two half carburetors. One, containing the float mechanism and fuel jets is immersed in the tank. The other, having a throttle valve, venturi and spring-controlled air valve, is bolted to the intake manifold in the usual manner. By means of a tube which passes through the muffler, hot air is conducted to the fuel jets, where it picks up the gasoline and carries it through another tube to a hot spot built into the exhaust pipe near the engine. From here the dry gas passes into the front half of the carburetor, where it is diluted with the proper amount of air needed for making the right running mixture. The fuel is partly vaporized at the gasoline tank, making it lighter and thus more easily moved, and the use of the intake-manifold vacuum eliminates the fuel-lifting devices.

CABINET BAKES GRIDDLECAKES AT PRESS OF BUTTON

Griddlecakes are baked automatically in a recently introduced cabinet that functions at the mere pressing of a button and needs practically no attention except to fill a hopper with batter and to remove the cakes. The batter is fed to specially heated plates that cook and flap the cakes and require no grease. The machine can be set to operate continuously or to bake from one to four orders of three cakes at a time. A coin-in-the-slot mechanism may be had if the cooker is desired for drug stores, road stands or self-service restaurants. A thermostat keeps the plates at the proper temperature.



Top View of the Automatic Griddlecake Baker, Showing Stacks Nicely Browned and Ready

A Boat That Goes to Sea on a Railroad Track; It Is a Dance Pavilion Built on a Steel Framework That Rests on a Track Which Extends into a Lake

BOAT ON TRACK GOES NOWHERE BUT SERVES DANCERS

Probably the only pleasure boat that goes to sea on a railroad track has been constructed at Elsinore, Calif., as a dance pavilion. A large boat was built on a steel framework, and deep-sea divers were employed to lay a railroad track several hundred feet into the water. By means of an engine and steel cable, the boat, on its track, is run into a lake and withdrawn with its party of dancers when they are ready to depart.

WALLS OF LAMINATED GLASS HAVE COLOR OF PEARL

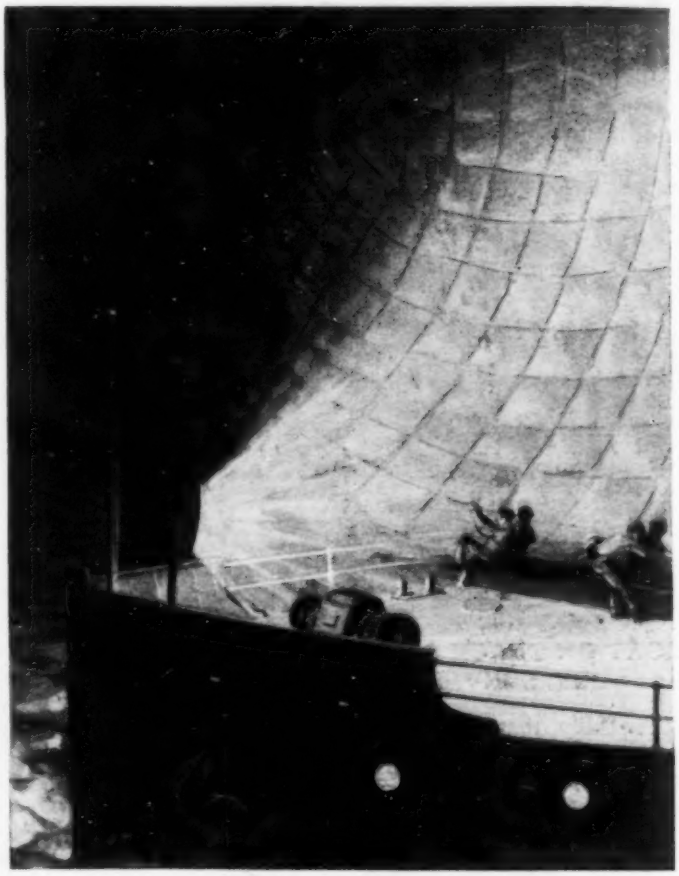
Walls, table tops, shelves and many other objects are being made of a special laminated glass that has a thin layer of a composition material between two sheets of glass. The middle layer is furnished in many different colors and patterns, and gives the whole the appearance of mother-of-pearl. The glass is especially suitable for the walls of a bathroom, as a substitute for tile. It is easily applied, is always lustrous, easy to keep clean and will withstand heavy shocks and rough usage. The wide variety of colors and patterns available enables a selection that will harmonize with almost any scheme of decoration.

FASTENERS FOR CLOTHESLINE ARE EASILY ADJUSTED

Three steel balls in a small cylinder with tapering end are the principal parts in a clothesline fastener that is tightened or loosened by a slight pull. The greater the pull on the line, the tighter the balls grip it, but the rope can be released instantly by a tug at the rear of the fastener, thus providing for quick adjustment for length. The device has a brass finish.

RIDING

By W. T. VAN ORMAN
Winner of the 1930 Gordon-Bennett International Balloon Race



OUT over the Atlantic ocean, with the nearest land 3,300 miles ahead, in a balloon with enough ballast to travel 1,500 miles—that undoubtedly was one of the outstanding thrills I have experienced during years of free-balloon racing in America and Europe.

We—C. K. Wollam, my aide, and I—had started from Brussels, Belgium, the evening before in the Gordon-Bennett International balloon race. Weather reports indicated that our best objective would be Brest, France. Shortly after noon, we passed over the Guernsey and Jersey islands in the English channel. Then something seemed to whisper in my ear, telling me that we had better check our course more carefully. We did this, and were surprised to find that our present direction would carry us to the north of Brest about five miles, missing land entirely, and straight into the open Atlantic.

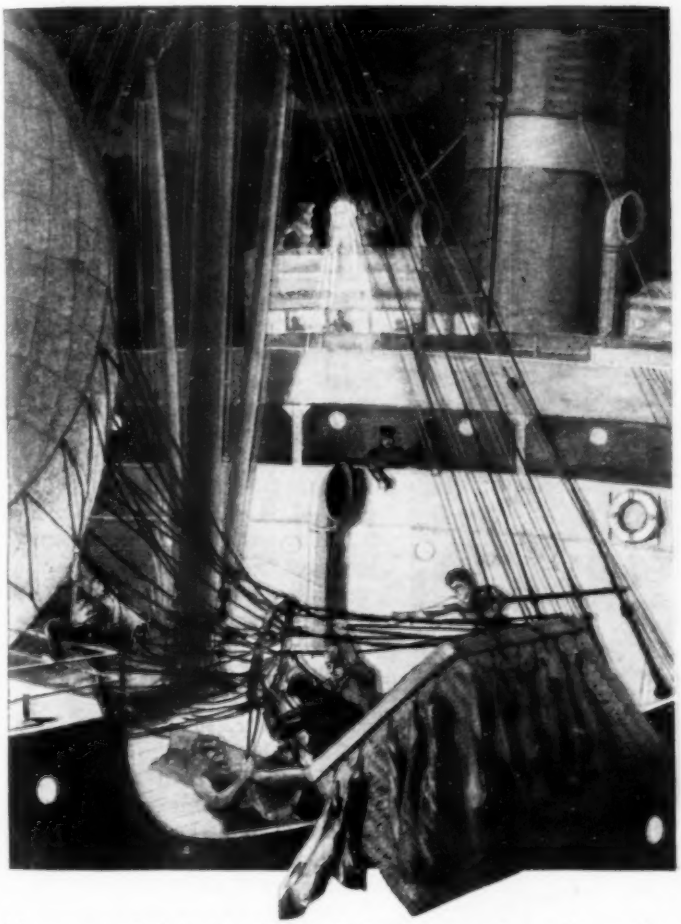
We tried all the air currents up to 25,000 feet altitude, but they were absolutely single-tracked—all moving out over the open sea. After vainly trying to maneuver the balloon so we could land on shore, we decided to head for the island of Ouessant, about twenty miles to the west of Brest. But at 7:00 o'clock we passed six miles to the north of the little island—and realized that America was the next stop.

After deciding that winds probably would change after a while, and blow us back over France, we tuned our radio to station 2LO, London, and picked up the disheartening information that the winds were going to blow toward the west for the next three days.

Then an idea, ridiculous at first, struck me. Why not try to land on the deck of a steamer? Foolish as it sounded, it seemed to be the only way out. We did not wish to descend on the open sea, for that would automatically disqualify us in the race.

Near midnight we sighted a little steamer, rolling in the twenty-foot waves. We were at 2,000 feet altitude. Grabbing a flashlight, I blinked it for several minutes in the direction of the steamer, then signaled, in Morse code: "We are going to land on board." To our great delight, the

the WINDS

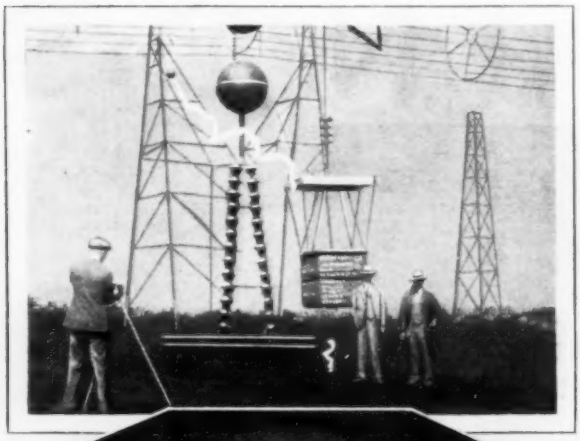


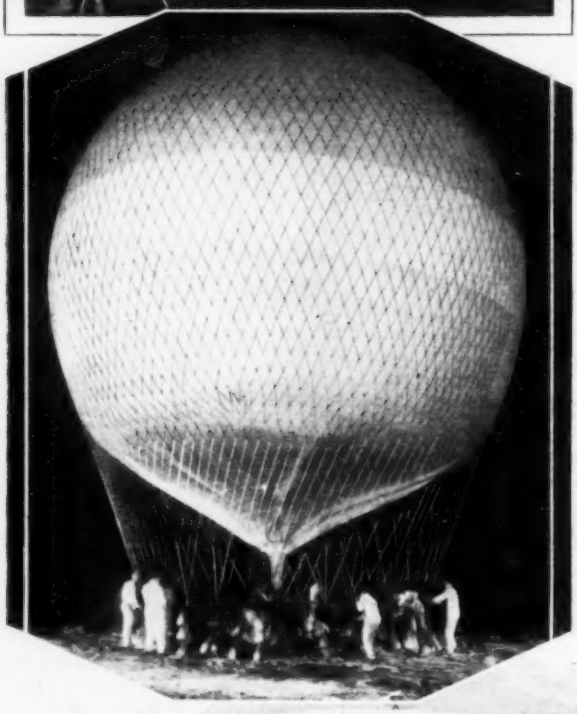
ship responded by flashing all its lights. So we swung down to thirty feet above the water, threw over our sea anchor to check our thirty-mile speed, and maneuvered until we struck the guardrail of the deck. A half-dozen sailors grabbed the basket, and, after the boat had swung round so that the bag would blow over the deck, I pulled the ripcord that released the gas.

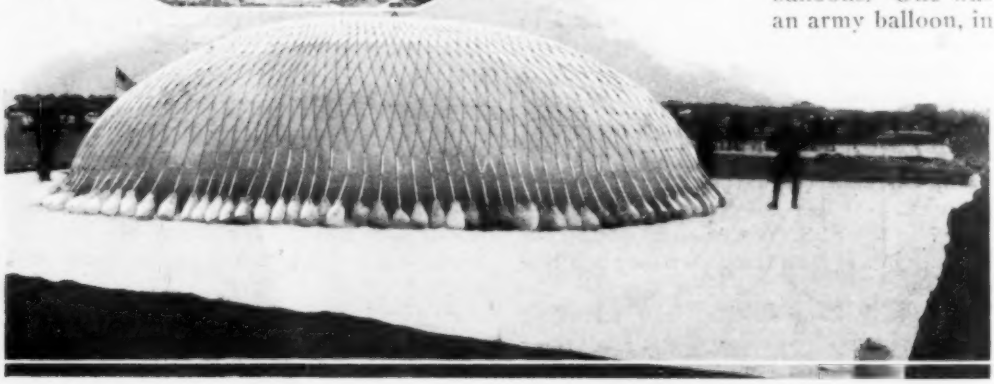
It was the S. S. "Vaterland," bound for Rotterdam, Holland, upon which we had dropped. It was the first time in the history of ballooning that such a landing had been made. We had made the greatest distance of any contesting balloon, but the Belgian Aero Club held that we were disqualified because we had descended on the sea. But the thing that hurt most was that the victory was awarded to a Belgian balloon crew that not only had come down into the sea, but nearly died of seven hours' exposure in the water near Spain.

Although I have flown hundreds of hours and thousands of miles in free balloons, I have yet to make a parachute jump in order to save my life. Not that I have never had occasion to jump, for I had, once. But I did not have time to do it. That was during the 1928 national race that started from Pittsburgh. With Walter Morton as aide, I was making good time over Pennsylvania when we encountered terrific thunderstorms in the vicinity of Greensburg. Efforts to get above the storm were futile, and our balloon was sucked into the swift currents. We reached 12,000 feet altitude, and encountered a severe hailstorm. Then we started downward at forty miles an hour. Morton and I threw out sand as fast as we could, but we might as well have tossed out a handful of tissue paper. The basket struck the ground with such force that our instruments were shattered. Then up we went again, to 10,000 feet, and then started down once more. We struck the ground again so hard it knocked our hats off, and again bounced upward.

At about 2,000 feet, after shouting greetings to Captain Kepner and Lieutenant Erickson in an army balloon that dropped rapidly past us, I turned, and there was a







blinding flash of lightning a short distance in front of my face. I looked up, saw the bottom of the balloon envelope clearly, and then everything went black. Five hours later I felt myself coming out of what seemed to be a very deep and peaceful sleep. The rain was beating down in my face. Then I realized that I was lying with my head on the ground and my feet and body in the upturned balloon basket. I called to Morton, but received no reply. After removing the equipment that held down my legs, and unfastening the wet parachute belt with considerable difficulty, I got up, and discovered Morton at my side. I felt his wrist, and was stunned to find no evidence of pulse.

In the distance was a farmhouse. Starting to run toward it for aid, I fell flat on my face. Then it was that I found one of my legs was broken. After five minutes of shouting, I heard several farmers come running across the fields. A physician was summoned, and announced that Morton had been struck by lightning, passing away instantly.

I later found that the hydrogen gas in the balloon had been ignited by the lightning, and that the craft's fall had been checked somewhat by part of the bag forming a parachute.

That same thunderstorm claimed two other balloons. One was an army balloon, in

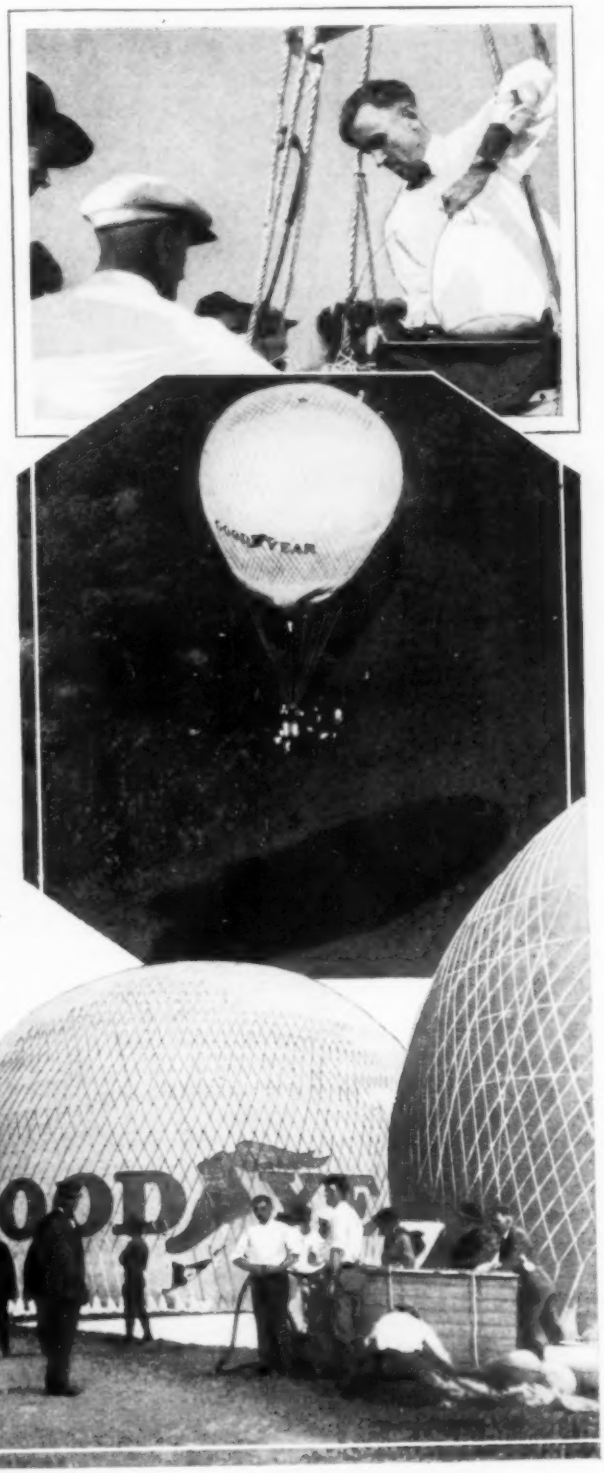
Testing Balloon-Basket Protector That Shields against Lightning; the Start of a Night Balloon Trip from Los Angeles, and Inflating the "Goodyear VIII" for the International Race of Last Year

which Lieut. Paul G. Everet was killed. J. F. Cooper, aide of a third balloon, was struck by lightning and severely burned, but recovered.

In spite of this awful experience, I do not consider ballooning extremely hazardous. The danger of lightning, one of the greatest that balloonists have been forced to face, has been largely overcome by means of a lightning shield which I developed, in co-operation with Arthur O. Austin, of Barberton, Ohio, following the Pittsburgh race.

One of the most pleasant thrills I remember came to me one night, following a take-off in a national race from San Antonio, Tex. Wollam was my aide. We were drifting at 2,000 feet over central Texas, in absolute silence. We turned on the radio set and tuned in stations all over the country. At midnight, we picked up WTAM, at Cleveland. Then, with startling clearness, came the voice of Mrs. Van Orman, speaking from Cleveland, 1,100 miles away, wishing us Godspeed.

The radio receiver has become one of the most important pieces of equipment the balloonist carries. It enables him to pick up weather reports, to learn of the progress of competing balloons, to detect and avoid thunderstorm centers, to enjoy music during dull hours in the air, and to locate his position



Ward T. Van Orman Taking Sand Bags Aboard Just before a Race; a Trainer Balloon Landing at Akron, Ohio, and Line-Up of the Bags in the 1930 Gordon-Bennett International Race

Van Orman, Left, and Alan R. MacCracken Just before the Take-Off, and Filling Van Orman's Balloon

with considerable exactness through the use of radio-compass equipment.

During the 1930 international race from Cleveland, my aide, Alan R. MacCracken, and I were able to receive constant weather reports from airways stations and from WTAM at the starting point. Perhaps the most exciting moments of this race were provided by thunderstorms that kept us company throughout much of the distance from Cleveland to Boston, where we landed.

There is one state over which most balloonists have learned to fly at a high altitude. That is Kentucky. It seems that the mountaineers, for some reason not exactly known, are fond of taking pot-shots at passing balloons with their squirrel rifles. Many believe the mountaineers do this because they think the balloons carry revenue officers. I am more inclined to believe that they regard the balloons, especially when they are flying high, as toys, not realizing that they are fifty feet in diameter, and carry two men and about a ton of sand.

Ballast is perhaps the most important part of a balloon's load. The more ballast carried, the farther the craft can travel. When sand is exhausted, equipment is thrown out, the less useful or valuable pieces first.

Often the question is asked, "Is the value of free ballooning consistent with the risk involved?" I feel that there is but one answer to that query, that the free balloon is, as we use it, the laboratory of the air. The Pittsburgh race, although it was tragic in many respects, gave much valuable data on vertical air currents and the lightning hazard.

We can say now definitely that vertical currents reach a speed of thirty-five miles per hour, and that, through ballooning, numerous improvements in navigating instruments have been developed, which are proving of value in other forms of aerial travel.

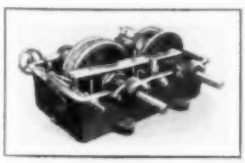
RADIO TUBES ACT AS FURNACE FOR BROADCAST STATION

Radio tubes are used to heat and supply hot water for the building housing the transmitting equipment of station WHK, at Cleveland. The rectifying and power-amplifier tubes behind the transmitting panel are water-cooled. From twelve to fifteen gallons of distilled water

are kept moving past the tube plates, and this process heats it to about 120 degrees. From the transmitting panel the water is led to the basement of the building, where it passes around another coil, part of the heat being transferred to a tank that supplies hot-water faucets. The water from the tubes then travels through copper coils kept cool by fans. In warm weather, air from these fans is led outside the building, but in winter an auxiliary fan forces the warmed air through a register into the building. It is only in rare instances that an emergency heater need be employed to keep the building warm. The heat that makes it necessary to cool a large radio tube does not come from the filament, radio engineers say, but is generated by electrons, shot off by the filament, striking the plate and raising its temperature, just as a steel target for a machine gun might be raised in temperature as the energy from speeding bullets is transformed largely into heat.

VARIABLE-SPEED CHAIN DRIVE REPLACES GEARS

Power is transmitted at variable speeds through a chain drive instead of by the usual gear method, thus increasing the efficiency and flexibility of various machine tools. The chain has self-adjusting slats projecting at right angles beyond its sides. It works between two pairs of conical disk wheels that have radial teeth cut in their sides. The slats on the chain engage the teeth on the wheels, the various speeds desired being attained simply by altering the position of the wheels so that the chain operates about them at different diameters. The movement of the wheels is controlled by a pair of easily operated levers, and a speed indicator permits ready adjustment at the proper setting.



DOOR THAT OPENS ITSELF IS BOON TO WAITRESSES

Doors are opened without touching them through use of the photo-electric cell, the "magic eye" of science. The device is especially suited to restaurant doors where waiters pass through with loads of dishes and are often in difficulty if they have to open the door in the usual way. As the person approaches and passes through a beam of light, shining on the cell, the interruption in the rays affects the cell, actuating a relay which operates the door-opening mechanism. The apparatus shown in the accompanying illustration is of the electro-hydraulic type and was recently tested in the laboratories of the General Electric company.

Door That Is Opened by Electric Eye When Approached, and Apparatus Which Operates It

RUBBER GUARD FOR ICE SKATES PROTECTS THE RUNNERS

Flexible-rubber guards are now provided for ice skates to protect the runners when the skates are not being worn. The guard is adjustable to fit different sizes, and is easily carried in the pocket when not in use.

Special Flag Authorized by Government to Mark Landing Fields Used by Air-Mail Planes

SPECIAL FLAG FOR AIR MAIL MARKS LANDING FIELDS

To designate airports where air mail can be received and dispatched, the government has authorized a special flag to be flown on such landing fields. The banner has a wing design on a light background and dark stripes at top and bottom. Only fields used for mail planes are permitted to display this flag. The flag was first flown at Burbank field, California.

INVERTED FISH BOWL IS HELD IN UPRIGHT CONTAINER

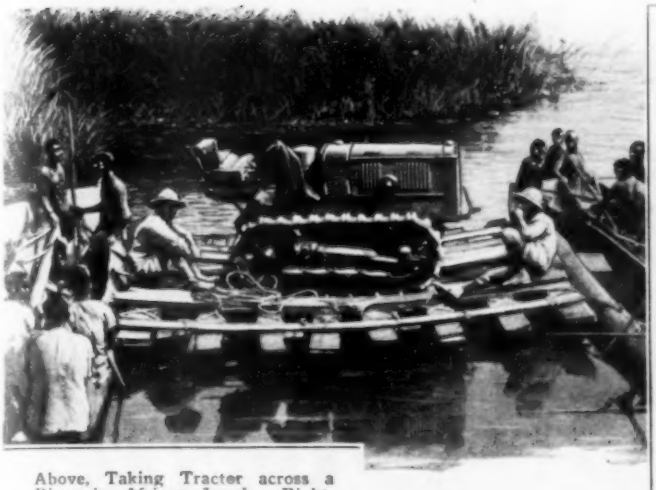
Double fish bowls are now becoming popular, a small one of crystal glass, which magnifies the fish, being inverted in a larger bowl. The large bowl is first filled with water, and the top one inverted and placed in position. A rubber hose is employed to suck the air from the inverted bowl, water meanwhile being added to the larger bowl, so that it will rise into the smaller one to replace the air.

HEAT WAVES PENETRATE BODY ACCORDING TO LENGTH

Why is it pleasant to bask in the sunlight while a hot iron held three or four inches from the face gives an uncomfortable sensation? The sun's seemingly cooler rays are actually much more energetic than those from the iron, yet they cause no pain. One reason, according to General Electric company experts who have been studying the heating values of various kinds of apparatus, is that sunlight is a deeply penetrating form of heat. It acts somewhat as a hypodermic, going beneath the surface of the skin without causing pain, while longer waves, emanating from relatively cooler sources than the sun, are partly reflected from the surface and partly absorbed in a very thin layer where they increase the surface temperature as in the case of heat from an iron. The body, consisting largely of water, absorbs or reflects heat much as water does. Water screens are sometimes employed in front of heaters to keep out the wavelengths that cause discomfort, while allowing the others to pass.

RADIO SWITCH ON TELEPHONE SHUTS OFF SET AT WILL

Answering the telephone without first making a trip to turn off the radio and later making a second trip to switch it on again, is now possible with a remote control for the radio set attached to the telephone. When the phone rings, it is only necessary to flip a switch on the instrument to turn off the radio set, and when the conversation is concluded, the set is again turned on without disturbing dial setting or volume adjustment. The control unit works with any set.



Above, Taking Tractor across a River in African Jungle; Right, Descending a Hill After Natives Had Prepared Steps; Below, Resting at a Native Jungle Camp

JUNGLE TRIP THROUGH AFRICA MADE WITH A TRACTOR

Journeying through the African jungle in a tractor was the novel experience of American engineers who a short time ago were given the task of spanning a vast empire in the heart of equatorial Africa to deliver the tractor and some farm machinery to plantations of the Belgian Congo. They used the tractor to cut a swath through the primeval wilderness, blazing a trail never before imprinted by tracks or wheels. Rafts and temporary bridges were often necessary to transport the equipment over lakes or crocodile-infested rivers, and at other times in descending steep declivities, natives were called on to prepare wooden steps to ease the heavy load down. Three weeks after delivery, fifty acres of virgin land had been cleared and was ready for crops, a task which would have been a year's work of the whole man and woman population.

¶A clock with an individual telephone number strikes the hour and gives other time signals when a phone user calls it; the arrangement is such that this number is never "busy."

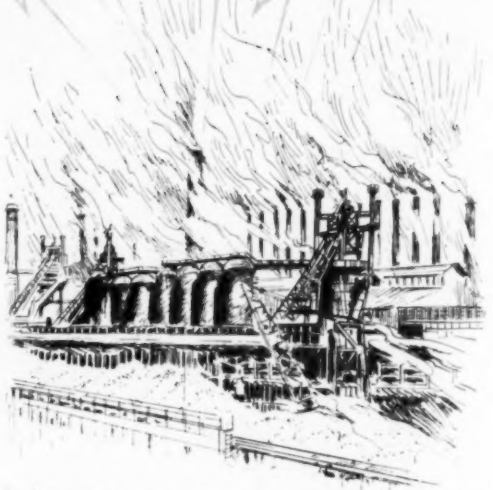
By GEORGE W. GRAY

ARCHIMEDES discovered the power of the lever more than 2,000 years ago, and boasted that if given a suitable fulcrum he would move the world. O. H. Caldwell, former member of the Federal Radio commission, recently pointed out that we now have an electrical lever so powerful that it recalls the old Greek's boast.

"Just as the principle of the lever is used repeatedly in this mechanical age," he said, "so the vacuum tube and its associated circuits present almost inconceivable possibilities in the electrical future."

But it isn't only to the future that we must look for the working of the electrical lever. The device is already on the job in a hundred different places in the home, the office, the factory, the school, the theater, the airplane, even on the street corner.

How, you may wonder, can a vacuum tube function on a noisy street corner? Well, in the town of Wilkinsburg, Pa., not long ago, I saw one of these electrical levers at a street intersection. One street was a main highway with an almost continual procession of vehicles. The intersecting street was a side road with only an occasional automobile or pedestrian. Ordinarily the traffic light at the crossing shone green for the main highway and red on the crossroad. And yet, every time a vehicle approached on the crossroad the light promptly shifted.



Artist's Drawing Depicting How the Wave of a Distant Hand Can Control a Factory's Machinery

It seemed a weird, uncanny performance, until you discovered a small electric lamp mounted high in a protecting case by the sidewalk. From this lamp a nar-

Electrical Lever

row beam of light shot down across the road, so that it fell upon a sheltered vacuum tube. Then, the explanation was easy. Every time a vehicle approached on the cross street it interrupted that beam of light. The photo-electric cell saw the shadow and responded instantly by setting off an electric signal which actuated a relay, or switch, and this changed the traffic lights.

The idea of the vacuum tube as a lever is peculiarly apt, because the tube does to electrical power what a lever does to mechanical energy. It amplifies power. With a crowbar a man may easily lift a ton. The vacuum tube does this electrically. The vibrations in space which carry radio broadcasts are unbelievably slight. When they reach your receiving set they would not be able to cause the slightest movement of your speaker or ear-phone. It is the vacuum tube, by its powerful leverage, that amplifies these weak impulses into energy strong enough to vibrate the speaker and produce sound waves.

The Grid Glow Tube, Resembling an Ordinary Radio Tube, but Capable of Magnifying Energy 100,000,000 Times

Recently I saw S. M. Kintner, assistant to the vice-president in charge of engineering for the Westinghouse Research laboratories, place his hand on a small silvered tube. Instantly lamps lighted in a miniature train, the train's wheels began to turn, and it moved off down the track as steadily as though an engineer were at the controls in the electric locomotive. As the train approached a station, the station lamps lighted up and remained aglow until it had passed. Presently Mr. Kintner removed his hand from the vacuum tube, and at once the train stopped.

Perhaps you think that this was only a toy demonstration. Then listen to this. A big steel plant down in Pennsylvania had recently been modernized by the installation of electrical machinery. One day the head of the company sat in his skyscraper office, on lower Broadway in New York, before a small glass bulb mounted on his desk. He touched the bulb lightly with a wave of his finger, and in response the electric current flowed into the mill 500 miles away, its wheels began to turn, its machines to operate.

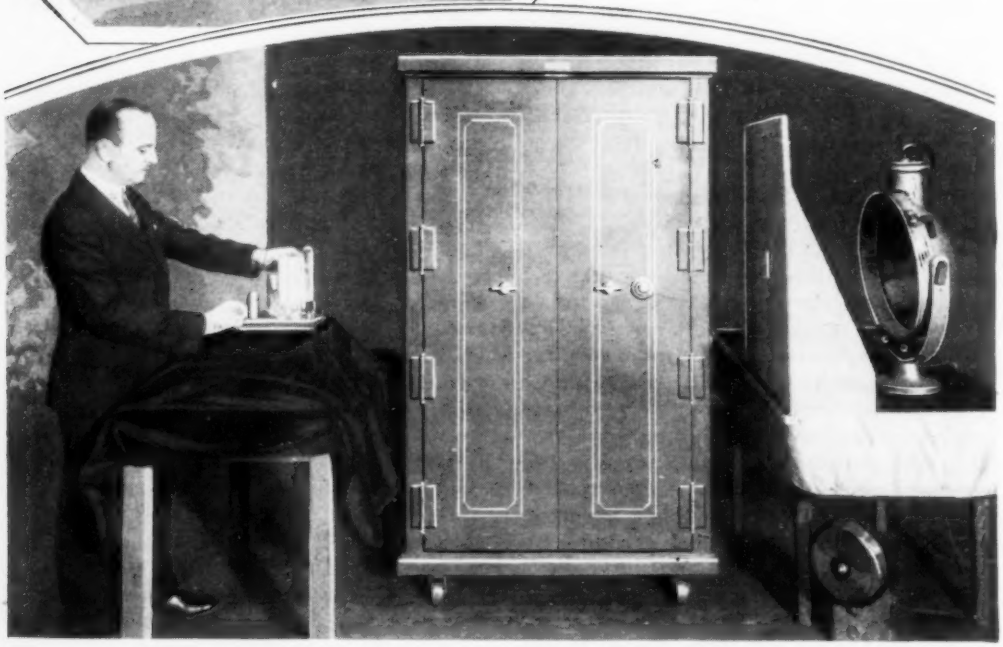
This control device, used both in commanding the toy train and in energizing the great industrial plant, is the grid glow tube, an invention of D. D. Knowles, a young physicist of the Westinghouse staff. "It is capable of multiplying the energy used to start its operation 100,000,000 times," explained Mr. Kintner.

The grid glow tube looks much like the ordinary radio tube, but it has no heated electrode and is no vacuum tube, but contains a small amount of inert gas. It is a relay tube, and has found a place in scores of mechanisms where swift and powerful control of larger energy is needed. This form of the electrical lever may be actuated by touch, by radio impulses, by light

through a photo-electric cell, or by sound through a microphone.

An interesting example of the use of sound waves in such a control was demonstrated at the Newark airport. An airplane was equipped with a siren which sounded a peculiar note. On the roof of the airport was stationed a large horn attached to a microphone—an electric ear. When the airplane came speeding in at night through the darkness, the pilot sounded the siren. The peculiar note of this signal, picked up by the microphone, actuated a relay which instantly switched on the floodlights, and the landing field was as bright as in daylight.

Televox, the so-called mechanical man, is operated on the same principle, with grid glow tubes as the brains of the robot. By a code of whistles, it can be called and asked any of a number of questions, and made to execute orders—to turn switches, open valves, measure the amount of



Above, the Electric Eye Keeping Watch at a Door; Below, Demonstrating How the Invisible Ultraviolet Ray Can Be Used as a Watchman and Burglar Alarm to Protect a Safe's Contents

One of the Huge Tubes That Is Capable of Generating the Powerful Cathode Rays; This Type of Vacuum Tube, and the Cathode Rays Themselves, Still Are in the Experimental Stages

water in a reservoir and report fires, floods, and other accidents. In short, it can be made to inform a remote human manager of conditions at the plant, where televox may be the only attendant. The Westinghouse engineers report that this electric control system has been installed in more than 400 industrial plants.

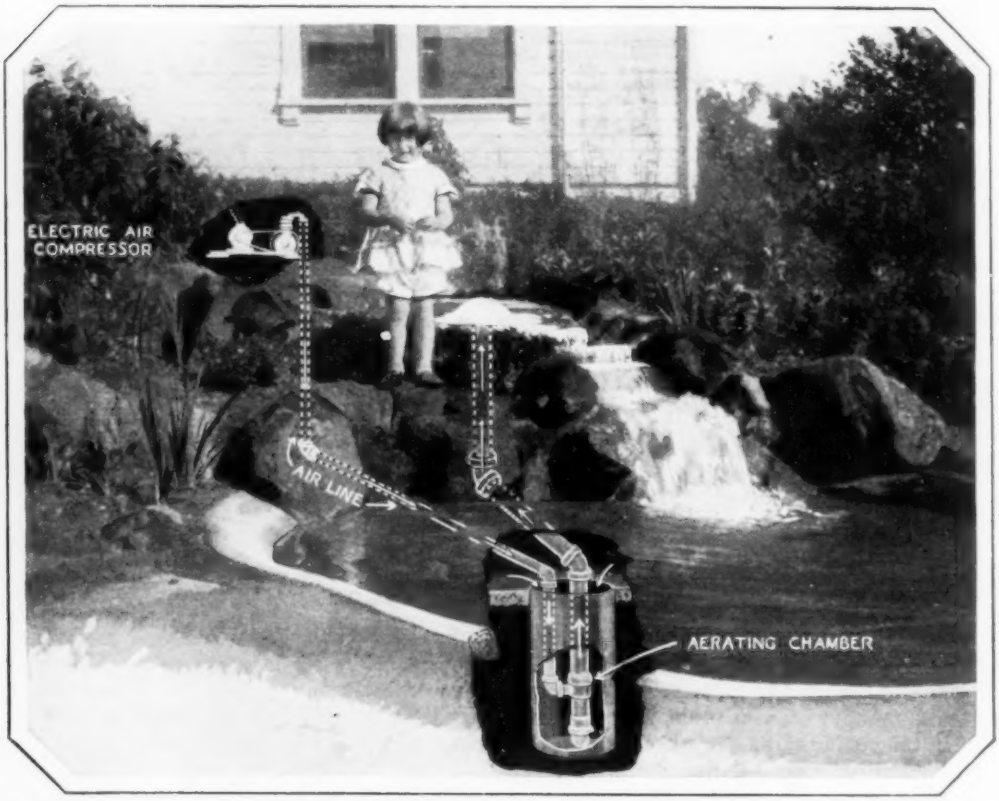
The use of the photo-electric tube to pull the long arm of the electric lever has brought a myriad applications, and the electric eye is fast rivaling the electric ear in numbers and in talents. Television, the talkies, picture transmission, fire-alarm systems, counting machines, inspecting machines, color-matching machines, heat-control devices—these are but a few of the applications of the photo-electric tube in the swift pace of modern life. It has been found that this electric eye is 165 times as sensitive to light variations as the human eye.

The electrical lever is a measuring device too. At the Washburn observatory of the University of Wisconsin, Prof. Joel Stebbins has installed two extremely sensitive vacuum tubes to measure the heat of stars trillions of miles away. The same vacuum tube—a four-element device—is being used in laboratories to measure minute electrical currents. Other types of vacuum tubes are adapted to different duties—one is being used to measure stresses and strains in material. It is said that so delicate and precise is this instrument that it will reveal and measure the bending of a three-inch plank caused by the weight of a fly alighting on it.

This lever was first put to work about twenty-five years ago and yet there are now nearly 200 different ways in which it is being used in industry, science, art, medicine and transportation. And this, we can only believe, is just the beginning. The electrical lever will eventually take over the major work of the world—if we are to judge its future by the past.

PLANES ARE LANDED BY RADIO WHEN FOG HIDES FIELD

Airplanes can be landed safely by special radio guidance even when dense fog shrouds the field. Transmitting and receiving apparatus developed by the bureau of standards make it possible for the pilot to tell by indicators if he is on the proper course, when he reaches the boundary of the field and if he is sending the ship down at the right angle of glide to make a safe landing. A visual pointer, actuated by radio beams, shows the proper curve to make at landing and tells if the plane is too high or low for safe approach. The signal is loud until the boundary is reached, and stops when crossing it.

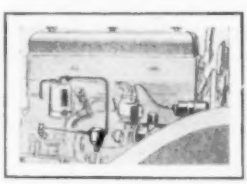


Artificial Waterfall Produced by an Altered-Gravity Pump and Air Compressor; the Diagram Shows How the Pump Aerates and Lightens the Water, Thus Forcing It to Lift Itself

WATER FORCED TO LIFT ITSELF BY ALTERED-GRAVITY PUMP

Water is forced to lift itself five to eight feet a minute by the use of a pump operated by a one-quarter horsepower motor that runs an air compressor. The compressed air is not used to force the water upward, but aerates and lightens it in a chamber at the base of the pump so that incoming water does the lifting at a rate of from twenty-five to thirty gallons a minute. No moving parts are used on the device, known as the "altered-gravity" pump, which is employed for raising water for artificial waterfalls, aerating and circulating water in tanks and ponds for the transportation and keeping of fish, and the aeration of acid baths for engraving plates. The pump has five parts, an outer steel shell or container, a circular chamber acting as pumping head, a discharge pipe to which the head is attached, an air line connected to the compressor, and a cap clamp. Since it is built of pipe, it is claimed it will last the life of pipe metal, and electricity is the only expense, since, in waterfalls and for other purposes, it uses the same water supply over and over, while the aeration purifies the pond of green algæ and other growths. The motor can be installed as far as 600 feet from the falls. Sticks and stones of ordinary size, it is claimed, will not clog the pump, which is self-cleaning.

MOTOR OIL FREED OF WATER BY ELECTROLYTIC METHOD



Water that seeps into and pollutes the oil in the crankcase of an automobile is removed automatically by a recently invented electric appliance which is quickly installed on any car. The water

is trapped by the device and separated into its elements, hydrogen and oxygen, by electrolysis, these gases then passing off harmlessly. The water remover has no moving parts to get out of order and no switches, the oil itself acting as a circuit breaker, starting and stopping its operation. When working, it uses less current than a light.

BICYCLE WHEEL IS EXERCISER FOR EYE MUSCLES

Muscles of the eyes, like those of other parts of the body, require exercise to grow strong, and an optometrist has made an exerciser to give the eyes their daily dozen. The apparatus is an old bicycle wheel covered with a dark cardboard or other surface. When the wheel is turned, a white mark is drawn on the board in the form of a spiral which the eyes follow as it enlarges.

Apparatus to Exercise Eye Muscles Made of Bicycle Wheel; the Eyes Follow the White Line

Pilot Demonstrating How He Repaired a Broken Landing Gear While the Plane Was in Flight, Enabling Him to Make a Safe Landing

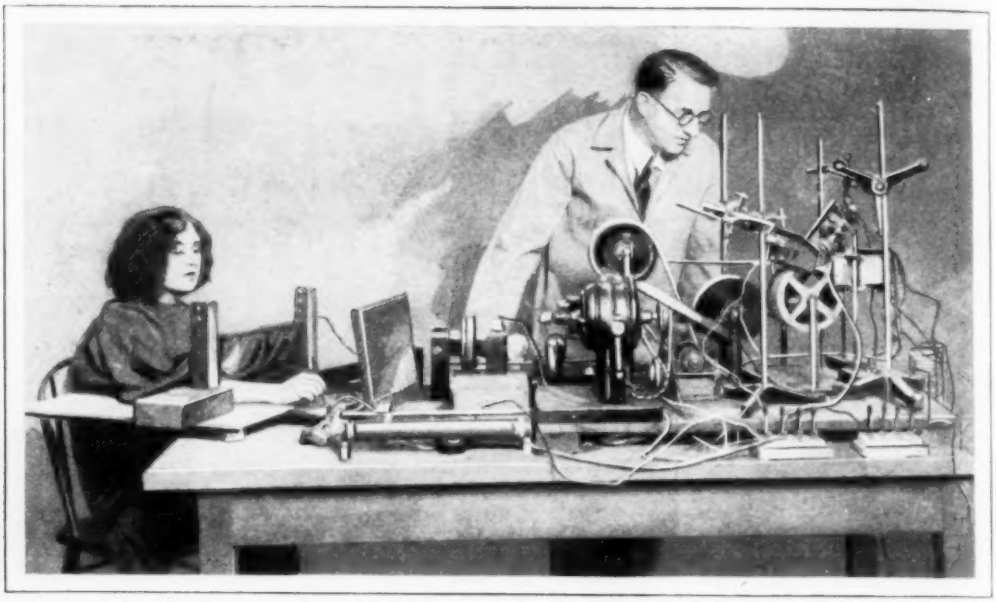
LANDING GEAR REPAIRED IN AIR WHEN PLANE IS DISABLED

Stretched on the wing of an airplane in flight, and without a parachute to save him if he loosed the grip of one hand, Floyd H. Ririe, a transport pilot, recently repaired his ship's landing gear. He pulled back into position a part of the gear that had broken at the take-off, and made a safe landing on one wheel. A student flyer kept the ship in level flight while the pilot performed his perilous task.

DEADLY AUTO GAS ELIMINATED BY FUEL-SAVING APPLIANCE

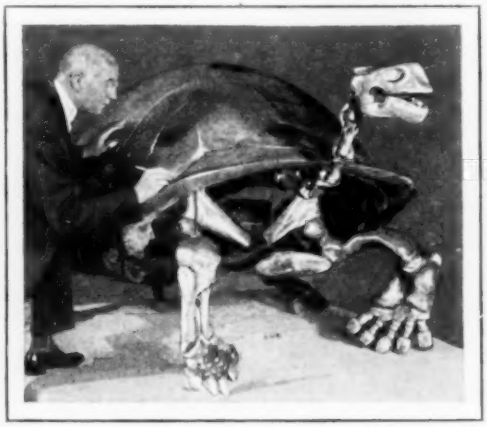
Tests have been conducted recently with a small appliance which is attached to the intake manifold of an internal-combustion engine for the purpose of regulating the fuel mixture, thus effecting gasoline economy in the operation of an automobile or airplane, and at the same time reducing the amount of deadly carbon monoxide in the exhaust gases. It has been used on an airplane, where the inventor claims a fuel saving of one-third was shown, and with an automobile virtually doubled the mileage per gallon. It weighs only a pound and a half, is not expensive, and is easily installed. A dial on the dash registers the wastage of fuel, and the instrument is adjusted to correct the mixture.

ELECTRIC SHOCK PROVES EFFECT OF PUNISHMENT



Apparatus for Measuring the Effect of Punishment on Children; the Subject Is Trying to Guide a Stylus through a Star-Shaped Channel, Each Error Resulting in an Electric Shock

Through the development of an intricate piece of apparatus, the influence of punishment on learning, especially among children, can now be measured. The machine, invented by Dr. M. C. Barlow, of the psychology department of the University of Utah, seems to verify the truth of the adage, "Spare the rod and spoil the child." The apparatus is used to determine the effect of electric shock in learning mirror tracing, the shock being the "punishment" which is meted out when a mistake is made. The student gazes at a star-shaped maze in a mirror placed in front of him and above the star, and attempts to guide a metal stylus through the quarter-inch-deep channel of the star. If the stylus touches certain points, a distinctly unpleasant electric shock is transmitted. The conclusion reached from the experiments was that "mild punishment brings about a decreased rate in visual sensory-motor learning, but increases the accuracy."



Fossil of a Prehistoric Tortoise; the Shell Is Seven Feet Long and Nearly Three Feet Deep

SEVEN-FOOT TORTOISE SHELL DISCOVERED IN INDIA

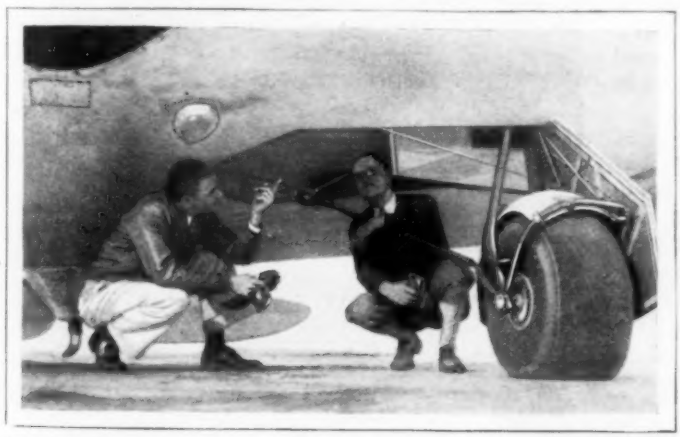
Having a shell more than seven feet in length and nearly three feet in depth, the fossil of a huge tortoise, perhaps the grandfather of the entire tortoise family, was found in India by Barnum Brown, dinosaur hunter. In life, this tortoise probably weighed more than 2,000 pounds, seven times as much as the largest of its kind now in captivity in the New York zoo. The fossil has been brought to this country and placed on display in the American Museum of Natural History in New York.

FISH ATTRACTED BY WHISTLE ARE CAUGHT IN HANDS

Natives of some sections of India have several unusual methods of catching fish, including luring them by whistling. In Assam, fishermen crouch on the banks of shallow lakes and emit a shrill whistle which attracts a species of mountain fish. Lured by the sound, this fish darts into the open palms of the whistler and is caught. In other places the direct rays of the sun force mountain fish to seek shelter beneath or beside rocks along the banks of streams. The cunning hillman crawls to a bowlder behind which a fish is hiding, strikes the rock a heavy blow with his steel-shod club, and catches the fish, stunned by the sound vibrations.

LANDING GEAR FOLDS IN WINGS TO INCREASE SPEED

To increase the speed of the monoplane purchased several months ago by Col. Charles A. Lindbergh, a retractable landing gear and a wing, with a recess in its underside to receive the landing gear, have been made. When the ship is in flight, the large doughnut-shaped low-pressure air wheels and braces are folded up into the wings to decrease wind resistance. These large wheels assure a safer landing on a muddy or rough field but, until the retracted landing gear was developed, decreased the ship's speed. With this latest equipment Colonel Lindbergh's ship is expected to be able to travel at 225 miles an hour in level flight.



Retracting Landing Gear and Wing Developed for Colonel Lindbergh's Plane; the Wheel Folds into the Recess in Underside of Wing

Early Locomotive Which Derived Power from Horse, Walking Treadmill Geared to Car Wheels

LOCOMOTIVE RUN BY A HORSE ONCE WON PRIZE

Seeking a dependable motive power for its road, the South Carolina railroad company one hundred years ago decided that horse power was the most promising, and offered $500 for the best design of a horse-operated engine. The National Museum today has the model of the "Flying Dutchman" which took the prize. It derived its power from a horse walking an endless-chain treadmill geared to the car-wheel axles. C. E. Detmold invented the locomotive which literally had one horsepower, and it was judged successful when it hauled twelve passengers at a speed of twelve miles an hour. The Baltimore and Ohio railroad tried a similar engine after a sailing car had failed.

¶ Ask the Bureau of Information for further details on articles in this magazine.

New Conquests

Above, Attacking Copper Plate with Oxy-acetylene Torch; Right, Interior of Berlin Restaurant with Modernistic Effects in Metal

COPPER, oldest of the metals in the service of man, is finding new uses which make it one of the most modern and adaptable of all materials.

In Germany, architects are building five-room cottages and massive churches of copper. In America, they are lining bank vaults with sheets of copper and imbedding heavy copper plates in steel vault doors.

Everywhere, both here and abroad, the ancient metal has come into increased use for roofing and piping, for screening, and as an essential in the electrical circuits and the automatic machines which are characteristic of our age.

One of these automatic machines is the mechanical refrigerator. A problem of the early makers was that of getting an air-

Glass Walls of a German Church Set in a Framework of Copper and Steel to Give an Unconventional Design of Unusual Beauty; the Nearest Approach to the Outdoor Cathedral

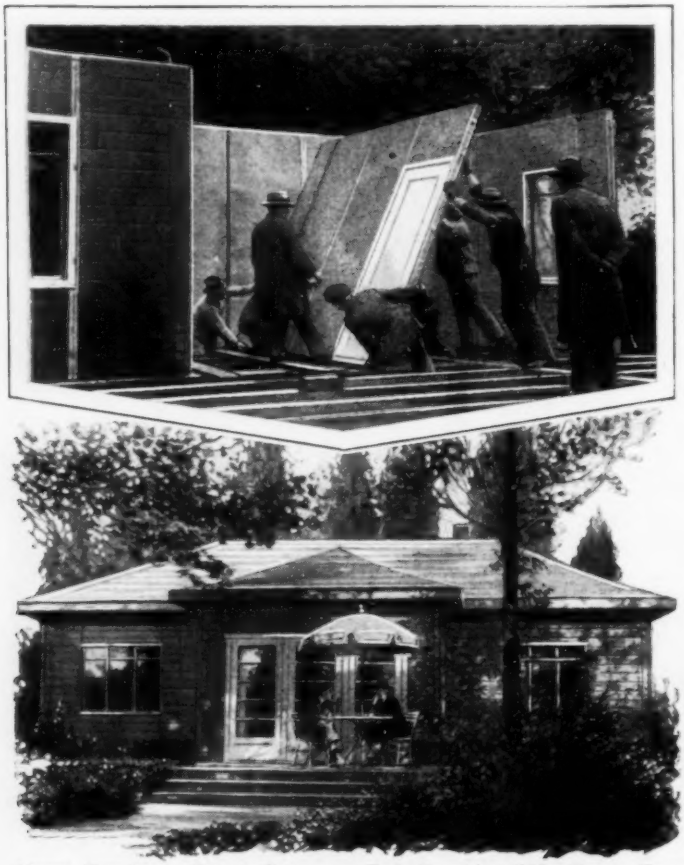
tight system. Try as they might, the joints and seams would sooner or later spring a tiny leak through which some of the refrigerative gas escaped.

Brazing, soldering, welding—all the various means of sealing metal—were tried in vain. Then Dr. W. D. Coolidge, whose laboratory had been working on this problem, remembered an odd discovery he had made in an experiment some time before. The event makes an interesting story.

It seems that this earlier experiment was concerned with the queer metal tungsten, which was difficult to work because, when heated, it immediately combined with the oxygen of the air and rusted. To get away from this danger, Doctor Coolidge pumped the air from the furnace in which he heated the tungsten and filled the chamber instead with an atmosphere of hydrogen gas. The tungsten showed no tendency to combine with hydrogen, and so he was able to proceed with his experiments.

Now, this experimenting had nothing whatever to do with copper. In fact, as you will see, copper entered into the matter quite by accident. In order to keep the tungsten in place, Doctor Coolidge wrapped and tied it with a small steel wire. One day an assistant used a copper wire, and when the scientist opened the furnace he found that the copper had melted and allowed the tungsten to fall. Apparently the experiment had miscarried.

But as he poked amid the debris, Doctor Coolidge saw something strange about that molten copper. It had run all over the place and down into the minutest crevices and pores. He had to get a microscope to follow the penetration of the copper, and chemical tests showed that it had flowed into holes even smaller than the microscope was able to reveal. The copper had "wetted" the metal cham-



Above, Erecting a Copper Cottage, a Task Requiring Only Twenty-Four Hours; Below, the Completed Home a Day Later

ber as completely as kerosene wets blotting paper. Other tests showed that copper has this amazing wetting capacity only when it is melted in hydrogen.

Here was a clear tip for the refrigerator makers. They built some huge hydrogen furnaces. They welded the refrigerator parts as efficiently as they knew how. Then they took these welded parts and placed them inside the furnace and brazed them with copper in the hydrogen atmosphere. Thus copper, treated in this special way, has proved to be the most effective plug for atomic leaks. Says one of the engineers who had part in this development: "It would be easier for a camel to go through the eye of a needle than for a single gas atom to go through one of these hydrogen-brazed evaporators."

Radio opened a great new field for copper, although it may be classed as only an extension of the electrical industry which has long been a heavy user of copper. Silver is a better conductor but is too costly, and copper remains the great conducting material. The electrical industry last year used more than 1,200,000 tons.

A recent development is the use of hollow copper tubes instead of solid wires as electrical conductors for high-power lines. Scientists have a theory that when an electric current passes along a wire, it is the surface particles of the metal only that are concerned. These surface electrons flow, and in their movement form the electric current, whereas the interior of the wire contributes very little to this flow. Since, therefore, the current is confined to the surface, engineers figure that a hollow cable will give as good conduction as a solid one, and at the same time will save weight and metal.

Another use of copper had its origin in the chance overnight visit of an American metallurgical engineer in a peasant's home in France. While motoring through the country his car broke down, and he applied to the nearest farmhouse for food and lodging. Watching the thrifty housewife prepare the evening meal, the American noticed that though her fire was small and her fuel sparse, she quickly cooked a large meal piping hot. He observed that the kettle, pots and pans were all of copper, and being a metallurgist, he realized at once that the copper was responsible for the swift and economical cooking, for it is an excellent conductor of heat.

Hastening home to America, the engineer set up a plate of steel, one inch thick, and with an oxyacetylene torch burned through it in two seconds. Then he burned through two inches of cast iron in seventeen seconds, using a fluxing rod

to help the torch and push through the molten metal. Next he set up a plate of copper, seven inches thick, and the torch flared and hissed into incandescence. Its flame, glowing with a temperature above 6,000 degrees Fahrenheit, played upon a spot on the metal. Soon the tip of the torch melted; its own heat destroyed it, whereas the copper was only just marked. Another tip was put on, and in a while it melted. Eventually the engineer was able to spurt the fiery blast for fifteen minutes against the plate of copper. Then his supply of gas was exhausted, and the torch went out. Measurement showed that the copper had been penetrated less than an inch. At that rate, the metallurgist figured, two solid hours of continuous burning would be required to put a hole through the seven inches. Since these tests, more than three hundred banks have protected their vaults with copper.

The most spectacular recent application of copper, however, is in the building industry. Builders have long used copper for roofing, for water pipes and other conduits, and for ornamental purposes. But it has remained for the modernistic architects of Germany to lead the way in adapting this metal as a material for walls and towers and structural sections.

Courtesy General Electric Co.

Copper-and-Brick Church; Brazing with Copper in Electric Tongs; Copper-and-Glass Tower

Churches, restaurants, apartment houses and private dwellings have made use of copper in towers, entrance canopies, window bays, staircases, balconies and other strategic places which are usually given over to some other material.

In Hamburg, there was erected during 1930 what its builders proudly call "the world's first copper dwelling house." It is a one-story, five-room cottage of the bungalow type. The entire exterior is of copper, with the exception of windows and doors. Houses of this type and size are being sold in Germany at about $900. The parts are all cut and shaped at the factory, and are numbered, and delivered to the site, ready to be erected with the aid of a wrench and a screwdriver.

Tiny Grinding Tool, Powered by Compressed Air, and So Small It Is Used Like a Fountain Pen

AIR-POWERED GRINDING TOOL USED LIKE FOUNTAIN PEN

So small that it can be held in the hand and used much like a fountain pen, a tiny grinding tool, powered by compressed air, employs mounted grinding wheels and smoothing stones of various shapes and sizes. It is intended to run at 60,000 revolutions per minute, this high speed being attained with such small tools without lack of balance. Special tips are provided to produce a high mirror finish on steel or soft metals, and felt buffing tips and abrasive tubes and sleeves are also available. The worker in wood can use the grinder with carving cutters.

TORNADOES ARE LESS DEADLY THAN LIGHTNING OR FIRE

Considering the frequency with which they occur, tornadoes are less deadly to human life than either lightning or fires. This is because tornadoes are short-lived and limited in scope, seldom traveling far enough to collide with human settlements. An average of more than 300 persons perish each year in the United States in such storms, but of the hundred or more tornadoes occurring annually, only a few cause loss of life, although when one does strike a populated district, it exacts a heavy toll. Tornado warnings are not issued by the weather bureau because of the extremely slight chance that such a storm will strike any given place, and usually only those causing loss of life are reported in the newspapers, thus giving rise to the impression that most such storms have fatal results. A twister seldom lasts more than an hour, and in any one place hardly more than a minute, its average path being about thirty miles long and only 1,000 feet wide. Therefore, if underground shelters are unavailable, it is often possible for those in danger actually to run out of the path of an approaching storm. It travels from twenty-five to forty miles an hour usually, and the velocity of its whirling winds has been estimated at from 300 to 500 miles an hour. In the center of the storm a vacuum is created. When this area of low pressure surrounds a house, it literally causes the structure to explode, because of the higher normal atmospheric pressure remaining in the house. The storms dip to the earth and rise again, often jumping over long stretches without damage, then descending to play havoc at points far removed from their last previous attack.

CATERPILLAR BIG AS A WHALE WHEN VIEWED BY CAMERA

Caterpillars and whales have little in common, particularly in appearance, but the eye of the camera can be employed to make even these forms of life look alike. An unusual enlarged close-up of a caterpillar on the stem of a leaf was taken recently. At first glance, the photograph bears some resemblance to a whale.

Not a Whale or a Prehistoric Monster, but Only a Close-Up of a Caterpillar on a Leaf

WINDMILL RAISES SAND TO RUN WATER WHEEL FOR MINING WORK

Prospectors setting up their equipment to operate a mine found that the only stream available did not furnish enough water to operate a water wheel, and tried a windmill, but this was also impracticable because the wind blew mostly at night when the ore crushers were idle. Finally the windmill was employed to operate a device much like a small grain elevator, and dry sand was raised by windmill power to bins, the sand being used later to run an overshot water wheel which in turn operated the rude mill for pulverizing the ore. The sand worked as well as water.

WET SUMMERS IN INDIA MEAN COLD WINTERS IN CANADA

Why do dry summers in India mean mild winters in Canada six months later, and wet Indian summers presage cold Canadian winters? Examining reports for a period of forty-four years, weather experts have found that, with four exceptions, when the Indian climate was unusually wet or dry, winters in Saskatchewan and Alberta have been either colder or warmer than normal. Such decided relations indicate that not only India's monsoon, but also the flood of the Nile in Egypt have a measurable effect on distant Canada, while high pressure over India is later reflected by correspondingly high temperature in Canada. On the basis of these correlations between pressures, temperatures and rainfall, Dr. C. F. Brooks, of Clark University, for six successive years had prepared a forecast for winter weather for Canada based on the summer in India. Of these six, two were nearly perfect, two fairly correct, one good and one poor.

¶ More than 1,000,000 passengers rode in airplanes in this country during the first half of 1930 when American aircraft flew over 68,000,000 miles.

Small All-Steel Boat That Will Not Sink and Can Be Taken Apart Easily; Air-Filled Caissons Support It

NON-SINKABLE STEEL BOAT CAN BE TAKEN APART

Small boats of all-steel construction that are unsinkable and fireproof recently have been tested successfully in France. The craft is easily disassembled, making it a simple matter to carry the parts on a trailer behind an automobile. It can be rowed, sailed or propelled by an outboard motor, the latter system being particularly suited for shallow water. The craft is supported by three air-filled caissons, two at the rear and one in front, and the motor is placed between the two rear compartments. It has an over-all length of about sixteen feet and a beam of four feet. Such boats can carry ten or more persons at a speed of ten or twelve miles an hour, with a four to five-horsepower motor, or heavy loads for camping, such as tents, etc., can be transported with a smaller number of passengers.

Above, Using Artificial Larynx That Works Like an Auto Horn; Below, Showing Its Compactness

ARTIFICIAL VOICE FOR MUTES LIKE AUTOMOBILE HORN

To restore the power of speech to persons rendered mute by surgical operation or paralysis of the larynx, S. P. Grace, of the Bell Telephone laboratories, has made a convenient and practical artificial "voice," which actually is a miniature automobile horn. Some time ago he turned out an artificial larynx, but it was found cumbersome to carry, awkward in operation and required close concentration on the task of talking. The latest apparatus weighs about four ounces and is simple to work. An electric battery which can be carried in the vest pocket, actuates the instrument. Connected to the battery is a little device consisting of a handle, a short metal cylinder and a soft rubber tube, two inches long. To speak, one must be able to make sound and force it through the mouth and nose, movements of the tongue and lips forming the sound into intelligible words. The artificial voice has a vibrating diaphragm which gives off a humming sound when a button in the handle is pressed to close the circuit. Vibration of the diaphragm not only creates the sound, but also, by drawing in air over the periphery of the tube opening and expelling it in a jet, gives it driving force over the tongue and out through the lips. The user simply inserts the rubber tube in a corner of his mouth and presses the button. Then he manipulates tongue and lips exactly as in speaking and intelligible words issue.

ALUMINUM-PLATED SHINGLES

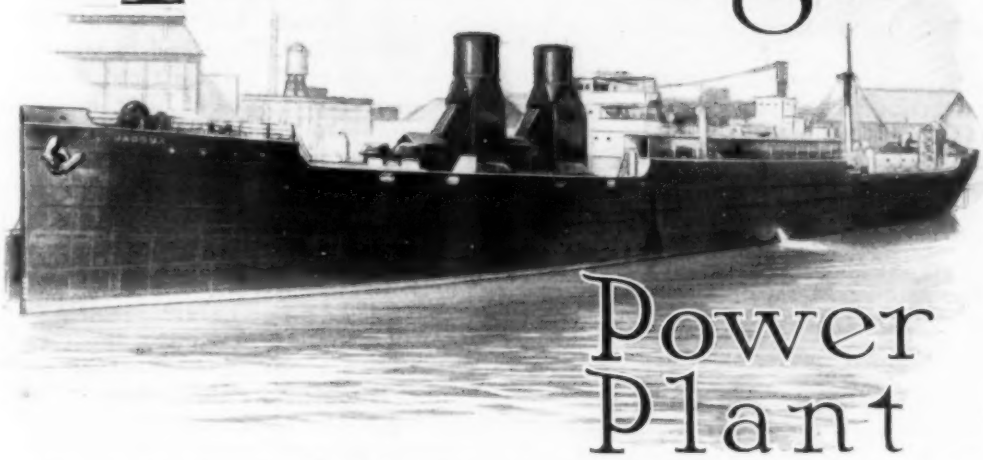
Aluminum-wrapped cedar shingles are being used on the Pacific coast where they are found to be impervious to the weather. They are obtained in various shades, only the part of the shingle exposed to the weather being treated. A plate of very thin aluminum is pressed by a machine on the butt of the shingle, and the sides crimped down over the wood. Such shingles do not crack or break and stand long exposure to water or sun.

TRIANGULAR BRIDGE HAS EXTRA STRENGTH AND STABILITY

Unusual strength and stability are claimed for a triangular railroad bridge recently constructed over the Roer river in Germany. The top of the structure forms the apex of a triangle to which the steel supporting beams are attached. In addition to the claim of greater strength, it has also been found that construction costs for such bridges are substantially lower than for the conventional types.

Triangular Railroad Bridge Which Is Stronger and Less Costly than the Conventional Kind

A Floating Power Plant



ONE of the strangest ships of recent days has been turned out of the ways of the Newport News, Virginia Shipyard and Drydock company. This ship is the "Jacona," a floating power plant. She was once a seagoing vessel belonging to the U. S. shipping board, but now her "insides" have been removed, and in the place of regular sea machinery, there are installed huge generators, transformers, oil tanks and other things necessary for a regular land power station.

A "mobile power plant" is probably a better name for the "Jacona" than "floating power plant." The ship was really designed to be moved from place to place where power is needed, and hooked up with the local terminals. The novel idea of having a mobile power station of this sort came from the president of the New England Public Service company of Augusta, Me., Walter S. Wyman. The "Jacona" belongs to this company and was converted under order by the Virginia shipyard. She was lying up the James river with a large number of other idle shipping-board vessels when the New England company began looking for a suitable hull to house a floating power station. The "Jacona" seemed to fill the bill and was accordingly towed down the river to the shipyard.

In the hull of the "Jacona" a 20,000-kilowatt electric-power plant has been installed. The old boilers were removed and new ones put in, the former compartments below deck were torn out and room made for the huge generators. A double bottom was fitted in and large tanks installed to hold fuel oil and water for the boilers.

The "Jacona" is 396 feet long and fifty-three feet across the beam. She draws about fourteen feet of water in towage, but when she is making a "set" before some town and she has her tanks filled with fuel, her draft will be much greater. The great advantage of a mobile power station is readily seen. Cities and towns located on the water could get electric power within a few hours if their local plants should become demoralized by storms, fires or floods, provided the power ship were anywhere in the vicinity. This is exactly what the New England company intends to do with the "Jacona" this winter. During the winter months storms play havoc with electric lines up and down the New England coast—and other coasts, too, for that matter—but the "Jacona"

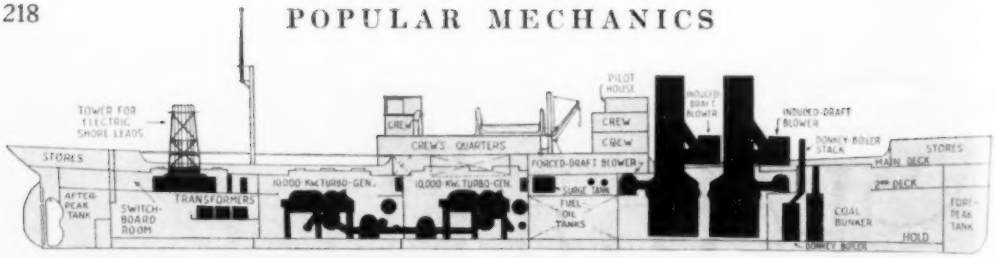


Diagram of the Floating Power Plant on Board the "Jacona," the Black Sections Representing the Location on the Ship of the Various Units of the Generating System

will lie in wait for such emergencies. The moment the power of a town or city is demoralized, she will be sent on her way to furnish rescue power.

In addition to regular emergency duty, the "Jacona" will be able to augment the local power plants when more electricity is needed. There will be times when the local power plants will need regular repairs, and the "Jacona" can be sent in to furnish current during this period. Local plants may also have new installations of all sorts made and the town lose no power, if this ship can be called in.

The idea underlying the "Jacona" has suggested several uses for similar ships. One of these is to furnish power for some of the numerous summer colonies along the coasts. Ships with much smaller power plants than the "Jacona" would be sufficient for such purposes. These colonies are usually entirely vacated during the winter, but contain several hundreds and even thousands of people during the summer. Electric power for such places during the "boom" months would be appreciated by the people and they would be glad to pay more than the normal rate for the convenience of being supplied with current.

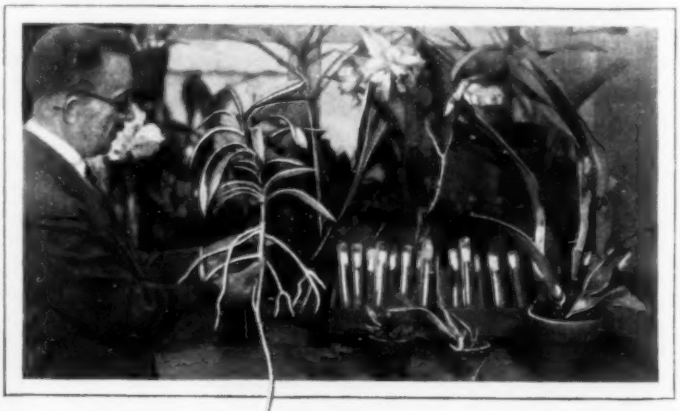
It was no easy matter to overcome all the difficulties in converting the "Jacona" into a power station. Some of the shrewdest engineers had to knit their brows over blueprints. The "Jacona" was originally a two-deck, three-island-type cargo vessel of 5,128 gross tons, built in 1919. The stack had to be removed during the conversion as well as the foremast, the shaft alley, lineshaft and tail shaft, and the stern bearing had to be blanked. New foundations had to be built for the power plant. Four boilers were put in, and these will furnish steam for two turbo-generators rated at 10,000 kilowatts each. The boilers deliver 280,000 pounds of steam per hour at 425 pounds' pressure.

The crew's quarters were not changed. During ordinary work the ship may house fifteen or twenty men.

The method of connecting the ship to the shore terminals was one of the greatest problems. But an arrangement was decided upon which consists of a steel tower on deck that may be moved if necessary. Two separate three-phase circuits, consisting of heavily armored and insulated cable, run from this tower and over a barrel crossarm to the shore. A large amount of slack must be left in this cable because of the tides and high waves.

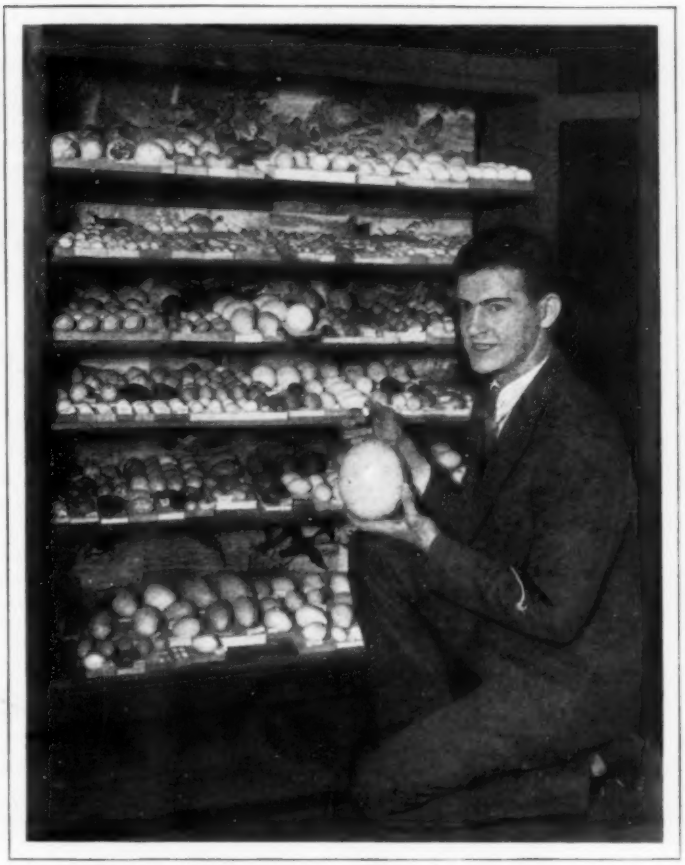
WHY THE ORCHID COSTS MORE THAN ANY OTHER FLOWER

Orchids, contrary to popular belief, are not so difficult to grow, but gain their reputation as the world's most expensive flower because it takes them so long to mature. Six years is the usual period for



Orchids in a Hothouse in Various Stages of Cultivation, Ranging from the Tiny Seedlings to the Plant Blooming Several Years Later

maturing a plant from seed, and then one flower only, or at most two, greets the orchidist. The next year he may get more blooms, and in twenty-five or thirty years, a fair succession of blooms. At one time their expense was due to the fact that they were gathered in the jungles along the Amazon, but today the finest specimens are cultivated. Dr. David Lumdsen, department of agriculture plant specialist, has thousands of these rare flower plants valued at potential millions in all stages of cultivation in a hothouse on the outskirts of Washington. Orchid seeds, after pollination, are grown in test tubes containing agar, a gelatinous seaweed substance from which the seeds obtain food. The slips and plants are transplanted several times as the growth continues, the orchid house being kept at a constant temperature of from fifty-five to sixty degrees. In nature, pollination is accomplished by the bee, but in the nursery a pencil point or toothpick is used. Seeds are developed eleven months after pollination. The orchid is the only flower of which there is a perfect record of crosses, and the rarest color is the albino, or white, occurring in nature only once in 10,000 times.



Some of the Valuable Collection of 800 Birds' Eggs Gathered by a Missouri Boy; More than 260 Species Are Represented

BOY'S BIRD-EGG COLLECTION HAS HIGH VALUE

What is believed to be one of the largest amateur's bird-egg collections in the United States has been gathered by Linscott Hall, a Missouri boy, who has a government permit to collect eggs and who has been pursuing his interesting hobby for ten years. He has 800 eggs which he values at $800. More than 260 species of birds are represented in the collection, which has been carefully arranged and tabulated. Young Hall sends an annual report to Washington concerning his finds during the year.

PLANE CONTROLLED FROM SHIP BY RADIOTELEPHONE

Control of airplanes from the navigation bridge of a ship may be carried on by radiotelephone up to a distance of about fifty miles, the navy's bureau of aeronautics announced after experiments with aircraft squadrons attached to the cruiser "Houston." The ship used its loud speaker as radiotelephone transmitter for ship-to-plane communication. Voice reception aboard the planes was good, and on one occasion was easily intelligible up to fifty miles.

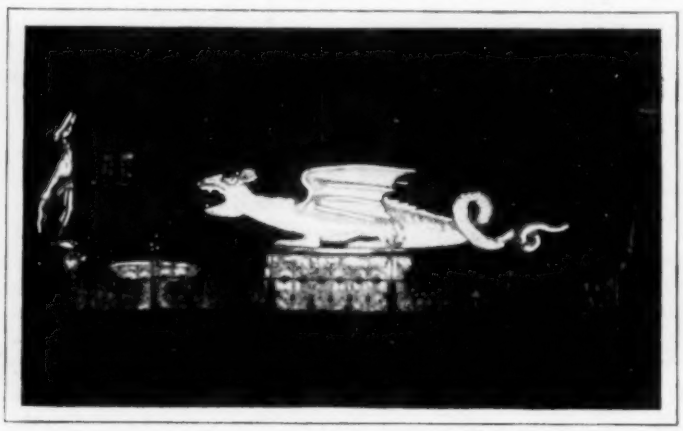
Basketball on Roller Skates, an Exciting Sport That Has Attracted Chicago Business Girls

BASKETBALL TEAM ON SKATES COMBINES TWO SPORTS

Chicago business girls have conceived the idea of combining two fast diversions—roller skating and basketball. They now play basketball on roller skates and find the game more fascinating than either of the forms of exercise separately.

FOUNTAIN SHAPED LIKE DRAGON ILLUMINATED AT NIGHT

Probably one of the most unusual fountains in the world is that known as the "Lindwurm" fountain in Klagenfurt, capital of the Austrian province of Carinthia. The Lindwurm is a legendary monster of the dragon type which figures in Germanic mythology, and the fountain, with its dragonlike aspect, presents a grotesque spectacle. Recently its appearance was made still more terrifying when floodlights were played on it at night during the celebration of the tenth anniversary of a plebiscite in Carinthia.

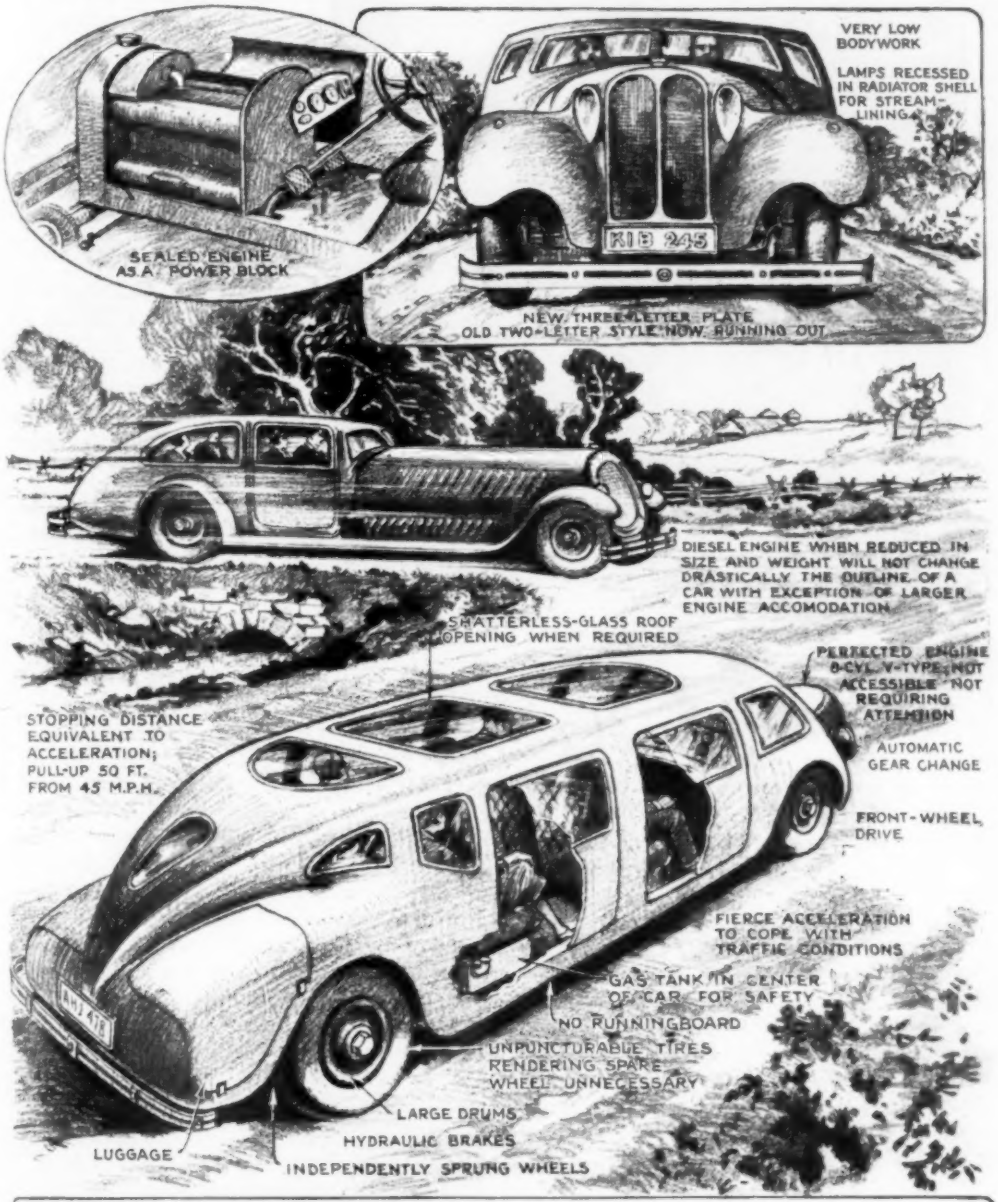


Grotesque Dragon Fountain in Austria Illuminated at Night

AIRPLANE DRAGLINE HELPS PILOT LAND IN FOG

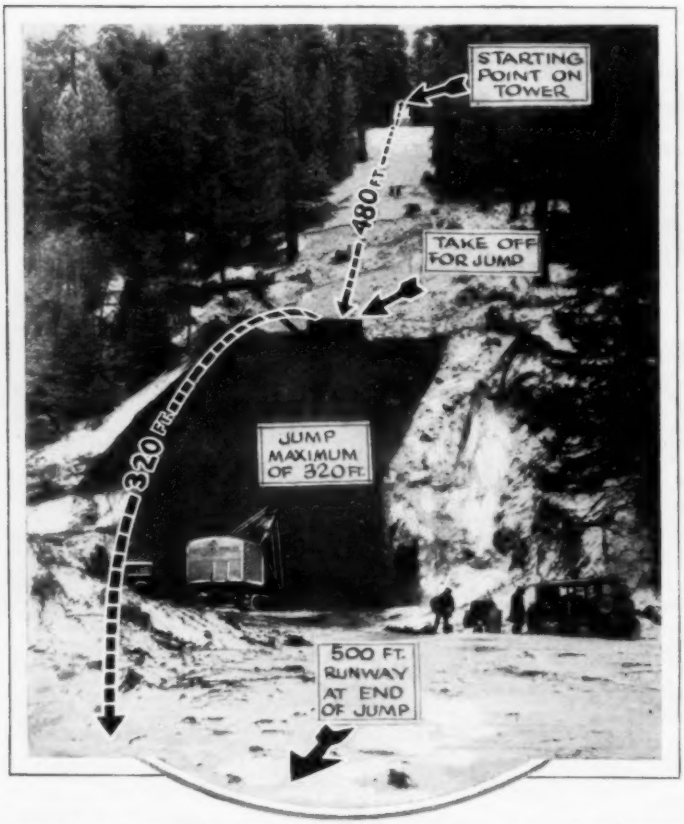
To assist the pilot in landing his plane safely on an unlighted field, or when fog obscures the area, British engineers have developed a simple dragline device which has worked successfully in a number of tests. It is of special aid during those last few seconds in "flattening out" just before the wheels touch the ground and when there is danger of stalling with a more or less serious crash. The apparatus, known as a "ground proximeter," is simply a weight attached to a linen thread and hanging thirteen feet below the wheels. As long as the weight rides free in the air, a green light shows in front of the pilot. The instant the weight touches the ground, a red light flashes, warning the pilot that the field is not more than thirteen feet below, so that he can glide on in with comparative assurance. His wind-speed indicator and other instruments enable him to check his speed so that there is little danger of stalling, and knowing that the ground is immediately below him, the pilot has little trouble in descending the remaining thirteen feet. More than 100 tests were made with the device, and three pilots pronounced the signal a success. The warning lights are operated on an independent circuit and are conveniently placed on the cowling above the instrument panel, in such a manner that they will not interfere with the visibility of the other gauges and dials.

FORECAST OF THE FUTURE TREND IN AUTOMOBILES


VERY LOW BODYWORK
LAMPS RECESSED IN RADIATOR SHELL FOR STREAM-LINING
KIB 245
SEALED ENGINE AS A POWER BLOCK
NEW THREE-LETTER PLATE
OLD TWO-LETTER STYLE NOW RUNNING OUT
DIESEL ENGINE WHEN REDUCED IN SIZE AND WEIGHT WILL NOT CHANGE DRASTICALLY THE OUTLINE OF A CAR WITH EXCEPTION OF LARGER ENGINE ACCOMODATION
SHATTERLESS-GLASS ROOF OPENING WHEN REQUIRED
PERFECTED ENGINE 8-CYL. V-TYPE; NOT ACCESSIBLE NOT REQUIRING ATTENTION
STOPPING DISTANCE EQUIVALENT TO ACCELERATION; PULL-UP 50 FT. FROM 45 M.P.H.
AUTOMATIC GEAR CHANGE
FRONT-WHEEL DRIVE
FIERCE ACCELERATION TO COPE WITH TRAFFIC CONDITIONS
GAS TANK IN CENTER OF CAR FOR SAFETY
NO RUNNINGBOARD
UNPUNCTURABLE TIRES RENDERING SPARE WHEEL UNNECESSARY
LARGE DRUMS
HYDRAULIC BRAKES
INDEPENDENTLY SPRUNG WHEELS
LUGGAGE
REDUCTION OF DISTANCE FROM BOTTOM OF CAR TO GROUND
1896
1927
1930
193?
20 IN
15½ INCHES
12½ INCHES
8½ INCHES

Courtesy The Graphic

Artist's Conception of What We May Expect in Automobile Design in the Next Ten Years, Judging from the Marked Changes Already Brought About as Portrayed at the Bottom



One of the Longest Ski Jumps in This Country Is That near Los Angeles Shown Above; It Has Provision for a 320-Foot Leap

SKI JUMP QUARTER MILE LONG MAY BRING NEW RECORDS

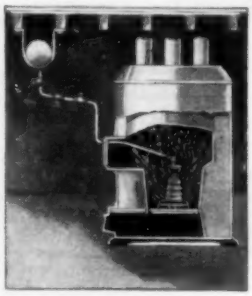
One of the longest ski jumps in this country has been cut through a forest at a recreation camp near Los Angeles in the hope that the big jump will result in establishing new world's records. From the starting point on a tower to the brink of the "jumping-off place," the distance is 480 feet, with provision for a maximum jump of 320 feet, and a 500-foot runway at the end of the jump.

COMMERCIAL FISH NOT FOUND IN HUDSON BAY REGION

Hudson Bay and Strait contain no commercial fish. A special expedition from the department of fisheries at Ottawa spent twenty-two days at fifty-five different stations in the district, covering 3,100 nautical miles, without finding any commercial varieties. The bottom of the Hudson Bay area consists chiefly of mud, loose rocks and bowlders, an unsatisfactory type for trawling operations. The various forms of life composing the bottom material were very meager and differed from those found on good fishing grounds.

BURNER CONSUMES WASTE CRANK CASE OIL

Utilizing waste automobile crankcase oil for fuel, an oil burner now is available that is inexpensive to operate and is adaptable to any type of heating unit. The burner is said to be free from soot, smoke and odor, and a series of special units are intended to overcome the difficulties usually encountered in burning crankcase oil, which, polluted with dirt and water, ordinarily has a low point of combustion. A motor contains the only moving parts. To install, the grates of the heating unit are removed and the firebox specially bricked. Fuel oil is first used to heat the generator brick, against which the waste oil is sprayed after it has been mixed with air in the nozzle of a gun leading from the motor into the firebox. Three minutes is required to heat the generator brick and then the waste oil is used. An electric device shuts off oil and motor if the fire goes out, and should the electric current cease, the oil flow stops as the motor dies. Ordinarily about eight gallons of the waste oil, which can be obtained at little expense, will heat an average house for twenty-four hours.



BETTER WAY TO FINISH WOOD IS FOUND BY RESEARCH

Research workers have found that present methods of sanding, fillering, staining and varnishing woods are at least theoretically incorrect, and better methods of beautifying and preserving them have been developed in the laboratory. Floors now are being curried instead of sanded, the "whiskers" being shaved off and filler applied under pressure. Such floors are much more durable than those treated in the ordinary way.

FIELD-GUN PRACTICE INDOORS ON THIRTY-FOOT RANGE

Superimposing a rifle of small caliber and an airgun on a regulation army howitzer one-pounder, an army gunner has created a weapon that enables accurate field-firing practice on an indoor range, thirty feet long. The smaller gun is placed over the larger and the regulation one-pounder sight is used. By research the exact aiming point has been found, making the small gun as accurate as the mother piece. Aiming through the howitzer sights, the gunner is able to fire the airgun or rifle with such accuracy that he can hit a match at thirty feet, this being equivalent to firing at the ordinary target at 1,200 to 1,500 yards with the field piece. A miniature town has been constructed as a target to make the practice range more realistic.

Field-Gun with Small Rifle Superimposed on It for Use in Indoor Target Practice

Tiny Air-Cooled Gasoline Motor, Weighing Eleven Pounds and Developing One Horsepower

TINY GASOLINE MOTOR WEIGHS ONLY ELEVEN POUNDS

Weighing only eleven pounds and developing one horsepower, a tiny gasoline motor has been invented by a German engineer. It is air-cooled, has no crankshaft and is so compact and light in weight as to be carried about easily.

LUCKY PHONE NUMBERS SOLD TO JAPANESE PATRONS

Telephone subscribers in Japan who do not like the number assigned to them may buy another more to their fancy through brokers who perform this service as a regular business. Certain numbers are considered lucky, and these bring large prices, often from $500 to more than $3,000, depending on the desirability of the number as an omen of good fortune. Eight is considered the luckiest number of all, and 357 is extremely popular. On the other hand, some numbers are considered unlucky, forty-two being the worst because it signifies death, while forty-nine also is undesirable. For this reason, the unpopular numbers are often assigned to police stations.

Diver Jumping from Springboard into Sand Pit, His Movements Being Regulated by Trainer Who Manipulates Ropes Attached to Safety Belt

SAFETY BELT USED BY DIVER FOR LEAPS INTO SAND

To train his swimming stars in attaining the proper form for diving, Princeton university's swimming coach has made a diving frame from which those in training leap headlong toward a sand pit instead of into a tank of water. The apparatus consists of a pipe framework, fifteen feet high, from which a safety belt is suspended by a pulley system. The diver fastens this belt about his waist and takes off from the springboard in the frame just as though he intended to jump into water. The coach manipulates the rope attached to the safety belt to balance the diver.

HARDY SPECIMENS OF WHEAT BROUGHT FROM RUSSIA

Several new varieties of grain from the oldest wheat lands in the world recently have been brought to this country from the great plateau grass lands of Russia, where wheat has been grown for centuries and where wild grain grows side by side with cultivated varieties. One kind of wheat grown in the Caucasian highlands appears to hold great promise. It is known as Russian or Persian wheat and is a short-stemmed, heavy-headed plant, maturing in a short season and growing well in a cold soil. The peasants follow the receding snow fields in spring, sowing this grain as fast as the snow melts, and often obtaining a yield of as much as fifty bushels per acre. Wild apples and several other varieties of fruits, including pears and cherries, also have been brought to this country from Russia for experimental purposes.

OLD CHAIN-DRIVEN STEAM CAR LIKE FIRE ENGINE

Bearing an amazing resemblance to a toy fire engine, one of the first automobiles built in this country is now stored in Los Angeles. It is a chain-driven steamer, the ancestor of the steam-driven cars popular a few years later. The vehicle was patented by Achille Philion in 1892, the same year that Charles Duryea built his gasoline motor car. It was one of the startling sights witnessed by those attending the Chicago World's Fair in 1893 and made a speed of ten miles an hour.

This Is Not a Toy Fire Engine, but an Early Chain-Drive Steamer, One of First Automobiles

One of Eight Giant Airplanes Placed in Service Recently on European Airways; These Ships, the Largest Used on Any Transport Route, Carry Forty Passengers and a Crew of Three

FORTY-PASSENGER PLANE USED ON EUROPEAN AIRWAYS

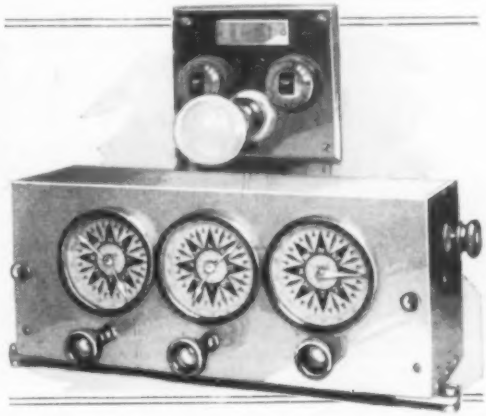
Eight giant transport planes, which will be the largest used on any passenger air route, are being placed in service by the Imperial airways in England. These huge ships each carry forty passengers in addition to a crew of three.

VITAMINS KEPT IN DRIED FRUIT BY DRYING PROCESS

In Europe a process of drying fruit has been developed that is designed to retain all the vitamins and essential oils at their full potency. This method consists in dehydration of fruits and vegetables by low-temperature drying under special humidity conditions and, aside from being rapid and cheap, causes foods to retain their flavor, color and aroma during storage. No preservatives are used in the drying process.

FOG-SIGNAL SYSTEM FOR SHIPS USES TWO-TONE WHISTLE

To prevent collisions of ships in fog, a system of continuous course signaling by means of two-tone whistles has been developed, the whistle blasts indicating to other ships having similar equipment the course of the vessel from which the sound emanates. The mechanism includes three units, the whistle, a geared motor to control it automatically and a broadcasting and receiving apparatus for interpreting the signals in terms of direction. The latter apparatus has three dials, one of which is set to the ship's course and operates the whistle. The other two are for receiving signals from other vessels, the two hands on these dials being set in motion at the end of one blast and stopped at the end of the next. One hand is used for blasts at intervals of more than one minute, and the other for closer intervals. The precision of the instrument is only impaired by the rate of speed at which the two vessels are approaching, and a correction can be made for this.



Dials Which Interpret Fog Whistles on Ships in Terms of Direction the Vessels Are Pursuing

'Round the Horn

By HAROLD T. WILKINS

The "Grace Harwar" under Full Sail While a Light Breeze Sends Her Plowing Sturdily through the South Atlantic

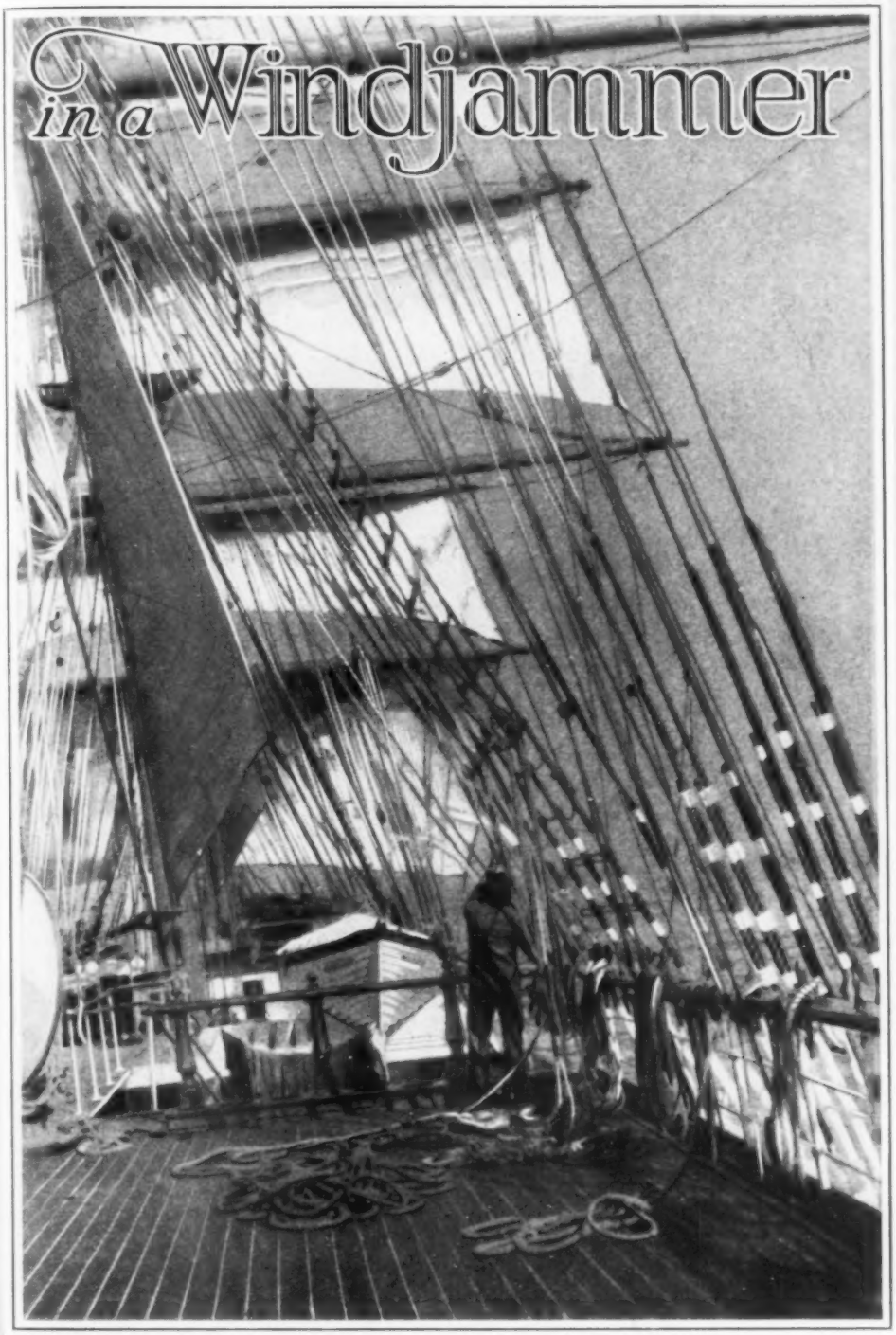
IT WAS in the last hours of the "dog watch" in a deserted newspaper office in a Tasmanian town a year ago. Two young Australian reporters, A. J. Villiers and Ronald Walker, had been looking at the picture of a windjammer when the following telegram arrived:

"Three-master sailer 'Grace Harwar,' flying distress signals, stopped liner 'Jervis Bay,' in Great Australian Bight. Boat put off from 'Grace Harwar.' Crew starving, 115 days out of Wilmington, North Carolina. Liner gave her food and steamed on, after blowing siren in salute of full-rigged sailer."

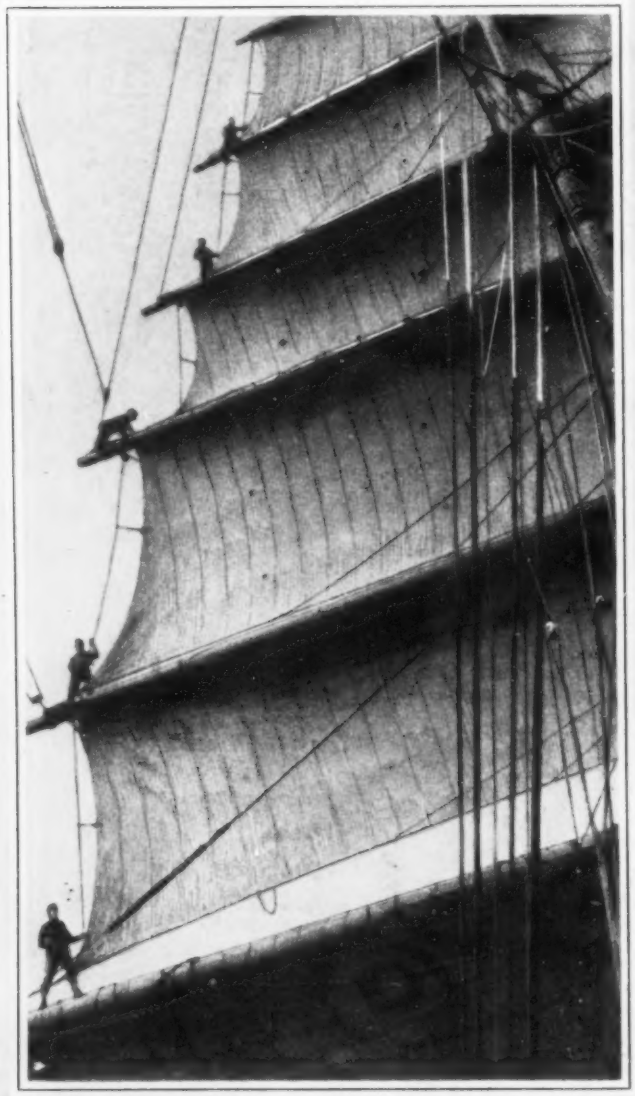
Before twenty-four hours had passed, Villiers and Walker had resigned, wired the "Grace Harwar" for foc's'le berths, and in four days were on the train for Adelaide and Wallaroo, the port of the "Grace Harwar," whose captain had telegraphed "Glad to have you." They boarded this steel full-rigged ship of 1,749 tons gross, stowed 6,000 feet of film and their movie cameras in the lockers under their foc's'le bunks, and with a crew of thirteen—mostly boys of an average age of nineteen years—sailed for Falmouth, England, laden with wheat.

It was their intention to make a record on the film of a square-rigged deep-water windjammer, rounding the Horn in roaring gales, her canvas booming and flapping, while seamen out on the pitching yards sought to bend the frozen sail with stiffened fingers, as the green-gray seas washed the decks.

In a Windjammer



From His Post Below, the Mate Shouts Orders to the Sailors Aloft on the Yards: Contrast This Scene with That on the Deck of a Modern Steam or Motor-Driven Liner



Aloft on the Yards as the Sails Are Spread to Catch the Trade Winds of the South Atlantic after a Journey around the Horn

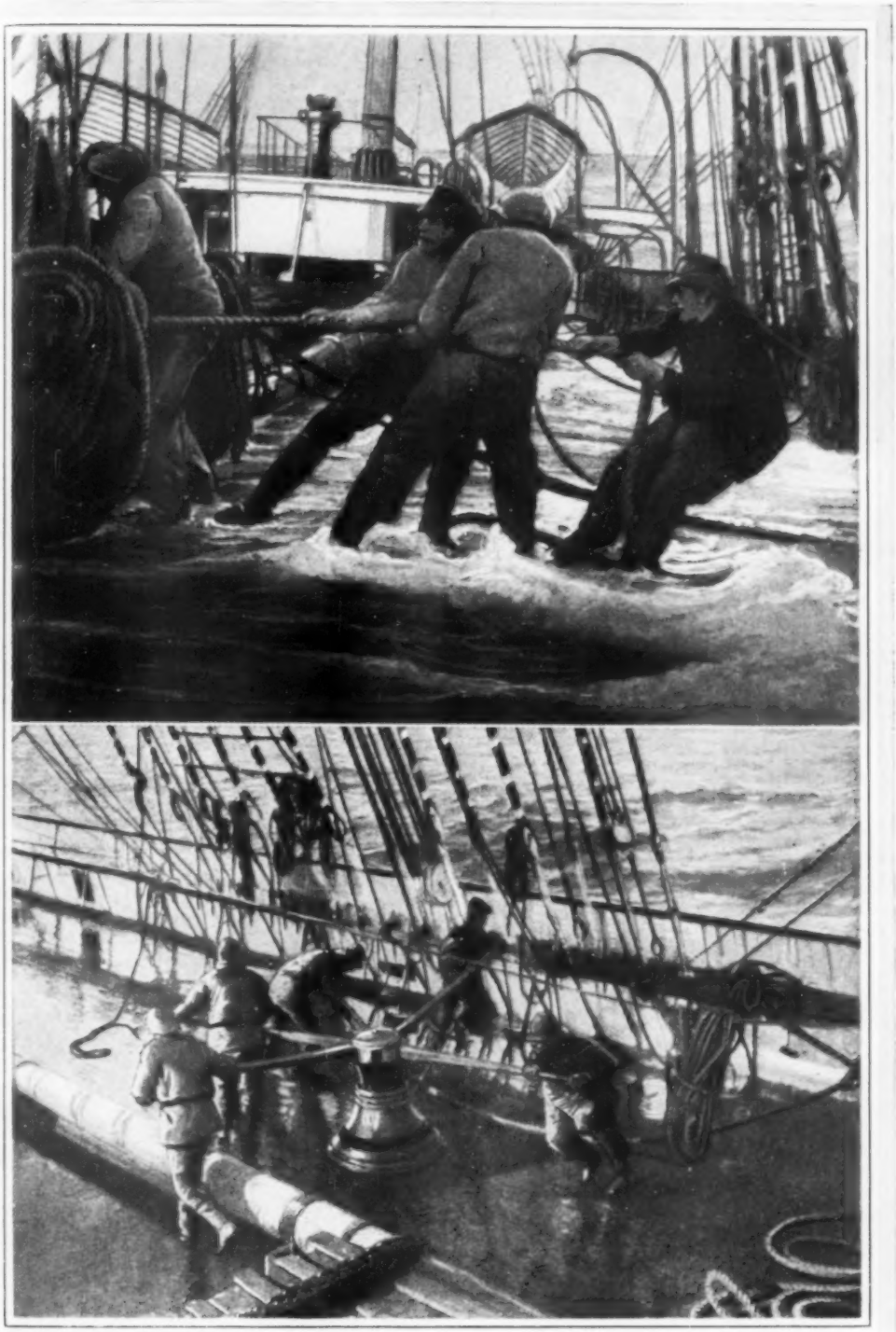
"We had struck a real old-timer, where the frozen wretches of the crew, on the long bitter run to the Horn, had to stand their frigid tricks at the huge open wheel, unprotected, tortured by the cold fury of the wind, sodden by the ceaseless rain, cut by the merciless hail," Mr. Villiers says.

Right from the start, heavy weather assailed the ship. Young fellows, astride the yardarms, furled sail amid a mad booming of canvas thrashing the yards, blown to ribbons by winds, against which the young chap at the helm had all he could do to hold the ship to her proper course.

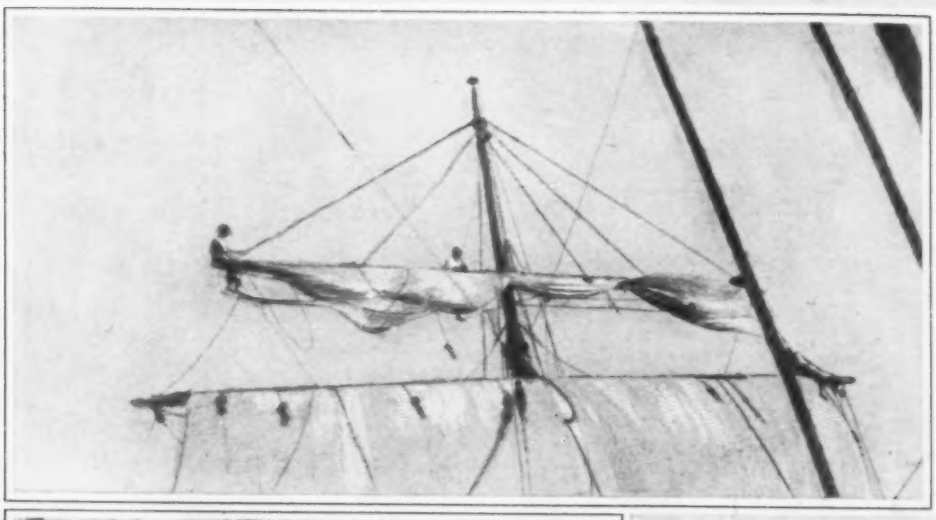
The gales drove the "Grace Harwar" a thousand miles out of her course, but there was worse to come. Aboard ship, the two newspaper men and amateur cinema photographers had no dark room and no fresh water to develop negatives. Fresh water in sailing ships bound round the Horn, is too precious to waste on films.

"We had a tiny cabin in the foc's'le, just abaft the cook's galley. It was a kind of dark room to load the film magazines, but there was no chance of developing, and it was infernally wet, and exposed to all the heavy seas that broke aboard and swept on over the lee side of the bulwarks," said Villiers. "They swept aboard ceaselessly and smashed against the steel bulkhead. The door fitted badly, the port leaked, and no putty would keep the water out. The sea seeped in from the galley outside as well as from the decks. Six inches of cold sea water would be swirling over our floor and wetting our bunks, and the salt spray so often smashed the glass of our one oil lamp, that at last there was only one glass left."

Thirty-eight days out of port, one bitterly cold dawn, the "Grace Harwar" was in the grip of tremendous seas and a hurricane, halfway to the Horn. She was helpless and could advance not a yard. Walker and a young Finn sailor boy were



Skill and Strength Are Prime Requisites for the Crew of a Windjammer; Even Sheeting Home a Sail with the Capstan, as Shown Below, Takes Plenty of Muscle



Casting Loose the Mizzen Topgallant Sail and Scene on Deck When the Weather Is a Bit "Fresh" in the South Atlantic

aloft loosening sails. The watch below on deck were bearing on capstan bars, operating a very primitive device for hoisting the heavy yard aloft. It was pitch-dark and icily cold.

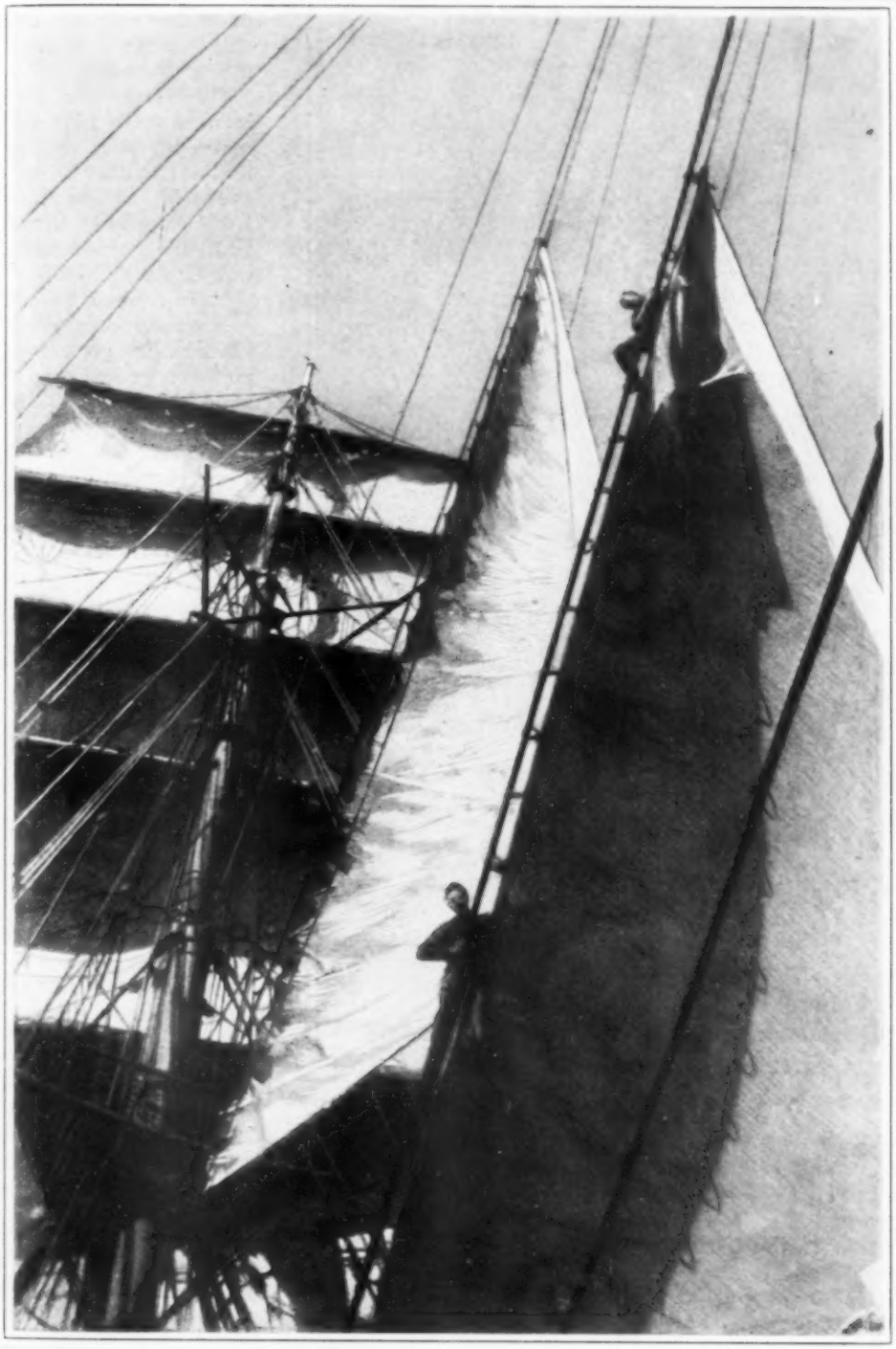
"Are you all right up there?" shouted the second mate above the roar of the wind and slapping of the canvas against the masts.

"All right, sir," shouted Walker.

"Suddenly, without warning," says Mr. Villiers, "there was a wild roar of smashing chains and blocks. Something hurtled swiftly downward in the darkness, and the watch scuttled for safety. High aloft a yard had crashed down onto something."

"Walker is hurt. He is caught between the yards," came a voice from aloft.

In less than half a minute, every man of the watch had shinned up the ratlines into the rig-



Hoisting the Sails for Friendly Winds; Fearless and Nimble, the Trained Seaman Is Master of the Maze of Rigging in All Sorts of Weather

On the Main Yard; Furling the Mainsail While a Blow Is in Progress Somewhere off Cape Horn

ging. Walker, still and white-faced, his lips and nose stained with blood, was lying on the yard close to the mast, with his feet still on the foot rope.

Blocks and tackle were rigged up, and, one sailor supporting the inert body, Walker was gently lowered to the deck—no easy matter with the ship buffeted by wind and water, and swaying like a pendulum.

There was no surgeon or radio and no other ship within a thousand miles.

"We laid him on a blanket at the foot of the mast by the capstan," said Mr. Villiers. A figure with a hurricane lamp stepped forward and gave a slow look. It was Captain Svensson.

"'He is dead' he said."

Next day, on a Sunday, the weather grew worse, and, at great risk, the main yard was backed, and the ship hove to for the burial service. The Finn helmsman tolled the wheel bell, the captain read the service and gave a short address standing bare-headed on the poop, while the crew could hardly keep their feet on the heaving decks.

"It is the first sea burial I have ever seen, and I never want to see another," Mr. Villiers declares.

Villiers then took up the photographing, all of which had previously been done by Walker.

He would shoot a few feet of pictures, and then crawl down the masts, where ratlines were often missing, to the decks, and wedge himself into a dark corner in the hold, while the seas pounded the ship and rolled her from side to side. Here he opened his camera, reloaded and sealed up the taken pictures.

The flying spray often drenched him and his camera, and more than once he was washed into the scuppers while he was trying to shoot the breaking seas. There was no dry place in the ship on the Cape Horn road, and no cool place in the tropics. It was a severe test of

cameras and film. He could not even develop a piece of the film to test the working of the camera. Off the Horn, a huge sea came aboard, broke through the steel door of the cabin and washed around the films in their sealed canisters of steel. He was not even sure if he could preserve the films when the pictures were taken.

Accidents still pursued the laboring ship. Rounding the Horn, a big sea came aboard and washed a boy into the boiling waves. The captain saw him swept past the poop, and promptly threw a lifebelt overboard. Then at the risk of all their lives, he ordered down helm. The masts trembled as the "Grace Harwar" came up into the wind and lay to in the trough, a boat was launched, Villiers in her, and the second mate stood up with a big steering oar, while the sweating boys labored to row the boat. Just when the light was going and all hope abandoned, the boy was sighted on the lifebelt and dragged aboard unconscious.

South of the Line in the Region of the Trade Winds; Seaman Taking Quickest Way Down from Aloft

At last, one day, the "Grace Harwar" was holding on her way up the South Atlantic, when she sprang a leak. It was all hands to the pumps, amid heavy seas swirling in the waist of the ship. Foul gases rose from the wheat in the hold. There was risk of fire from spontaneous combustion, but the raging seas made it difficult to ventilate the holds.

The ship was headed toward Capetown, but, when halfway across the South Atlantic, a sudden gale drove her far north. There was nothing to do but resume the original course. Food was running low when, 123 days out of port, the half-starved crew saw the lights of a steamer ahead. She saw their signals and changed her course, and sent aboard stores and food. A fortnight later, the "Grace Harwar" berthed in the harbor of Queenstown, Ireland, and a few weeks later, a tug towed her to Glasgow, where Mr. Villiers quitted her on the Clydeside.

ARTIFICIAL BLIZZARDS HELP TO PROTECT PLANES

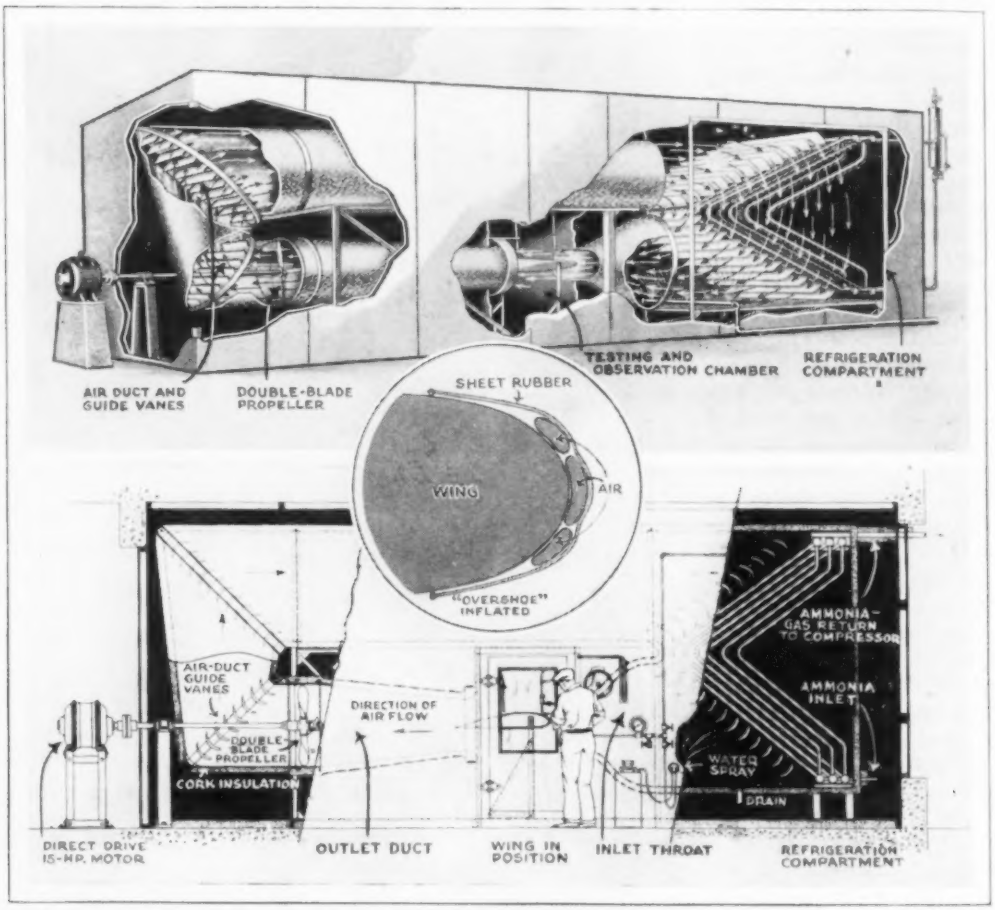


Diagram and Cross Section of Refrigerated Wind Tunnel Where Artificial Blizzards Are Produced to Study Effects on Planes; Center, Rubber "Overshoe" to Protect Wings from Ice

"Have a blizzard ready at one o'clock." This is not an order given the weather man, but is a typical request that would not cause much excitement among engineers at the B. F. Goodrich Rubber company in Akron, where one of the largest weather factories in the world is being operated. The other day a group of army aviators flew from Wright field, at Dayton, to Akron and watched one of the worst storms they ever had seen. An eighty-mile gale laden with snow and ice at below-zero temperature screamed past them, yet they remained comfortably warm because the storm was confined to a twenty-seven-foot box. The refrigerated wind tunnel was constructed as a weapon to be used against old man winter, who, in the past, has caused numerous airplane accidents by loading wings, wires, struts and other parts with ice. Full-scale wing sections can be placed in the test chamber and a layer of ice deposited on the leading edge in a few minutes. Motive power for the synthetic blizzard is provided by a large electric motor that drives two propellers placed at right angles to each other on a shaft. The air, in making the round trip several times a second, passes over cooling coils. Temperature of the air can be lowered to ten degrees below zero, and the velocity can be boosted to eighty miles an hour or better. The most dangerous temperature for the aviator is about twenty-eight degrees above zero, it has been found. At

this point, tiny droplets of water, supercooled to four degrees below the freezing point yet still liquid because of their surface tension, are floating in the air. When an airplane flies through such a mass of water vapor, the droplets are agitated, their surface tension altered and they immediately freeze into ice, much of which is deposited on leading parts of the craft. In the wind tunnel, this condition cannot be duplicated exactly, because the air and not the wing is moving. But ice can be created nevertheless. As the cold air passes through a funnellike opening just before entering the test chamber, it picks up water vapor from a set of spray nozzles. This is carried to the part being tested and deposited as ice. Dr. William C. Geer, of Ithaca, N. Y., has devised an "overshoe" for airplane wings, struts, wires, radio masts and other parts, and development of this to a commercial form is being carried out at the Goodrich laboratories. In the wing installation, a rubber shield or flap is placed about the leading edges and securely fastened along both edges by a slightly elastic device. In normal flight, this flap rests snugly against the wing and has practically no effect on the aerodynamic qualities. But when the plane enters a region where ice is deposited—and this sometimes happens with alarming speed—the pilot turns a valve, compressed air, introduced into a trio of rubber tubes beneath the overshoe, expands the surface, and the icy crust cracks. In a few seconds the ice has been removed, the pieces carried away by the air stream. The ice remover installed on wires is similar in principle, but has only one tube, and the air, normally kept at a slight pressure to preserve the contour, is exhausted when ice forms.

BASEBALL GAME WITH TOP LATEST INDOOR SPORT

Walter Johnson, famous pitcher and manager of the Washington "Senators," has introduced an entertaining baseball game played on a board with a spinning top. Counters are advanced on the board which represents a baseball diamond, according to directions which fall upward on the side of the top after it has ceased spinning. Practically all the plays possible in a real game are designated, and two players representing opposing teams may enjoy the board at one time. The counters are carried in a compartment within the top. With the game are furnished a number of scoring pads.

Courtesy The Washington Times

Baseball on a Table-Top Diamond; a Spinning top Directs the Movements of the Counters

TYPEWRITER CASE ALSO SERVES AS AN OVERNIGHT BAG

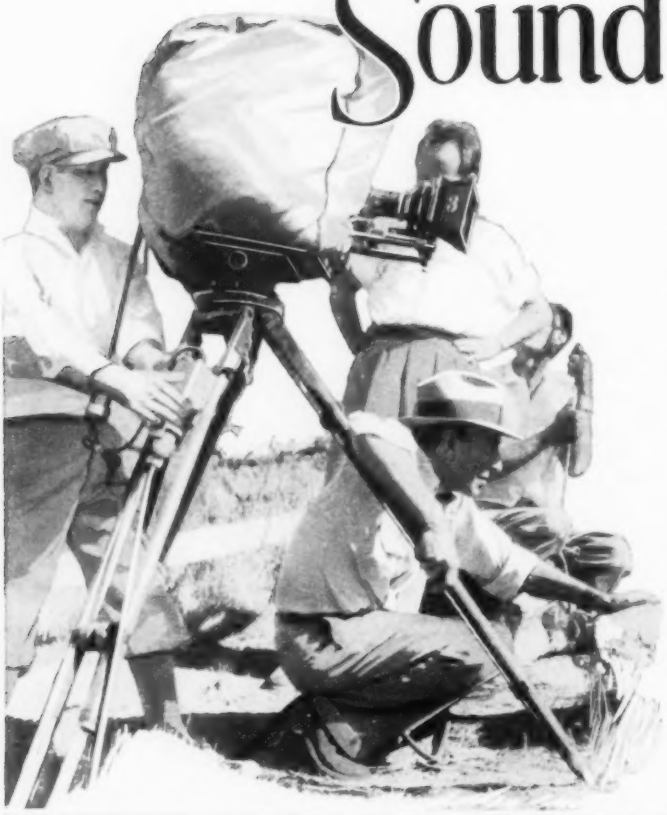
Double utility now is offered in the carrying case of one make of portable typewriter. This case is designed along lines to make it a companion to conventional hand luggage, and when the typewriter is left at home, the case can still be taken along as an overnight bag. In the latter capacity, it is large enough to accommodate two dresses and other articles of clothing and toilet accessories. It is finished in brown to blend with other hand baggage.

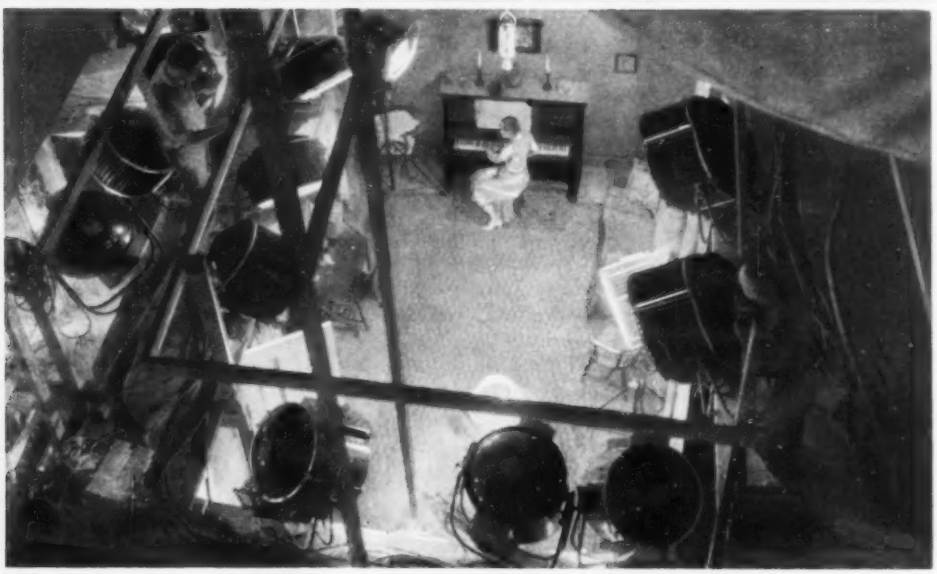
Sound Tricks

By JOHN DRAPER

THOUSANDS of tons of earth in a gigantic land slide move down a mountainside. The hero hears the rumbling grow in volume, is warned and snatches the heroine from her perilous position directly in the path of the onrushing tide.

Photographically, the problem is simple. In motion pictures, filming hair-raising scenes long ago were realized. But the sound? How did the sound engineer and the sound-effect technicians record on a narrow track the noise of earth sliding down steep mountainsides to its final resting





Above, Director William C. DeMille Crouching under Soundproofed Camera, and, Below, Looking Down on a Scene Featuring Doris Kenyon; Note Microphone in Center

in the Talkies

Illustrating the Use of the Beam Microphone on a Portable Base; It Is Placed alongside the Camera to Pick Up Sounds over a Long Distance; Note Shield around the Camera at Right of the Picture

place on the floor of a valley far below?

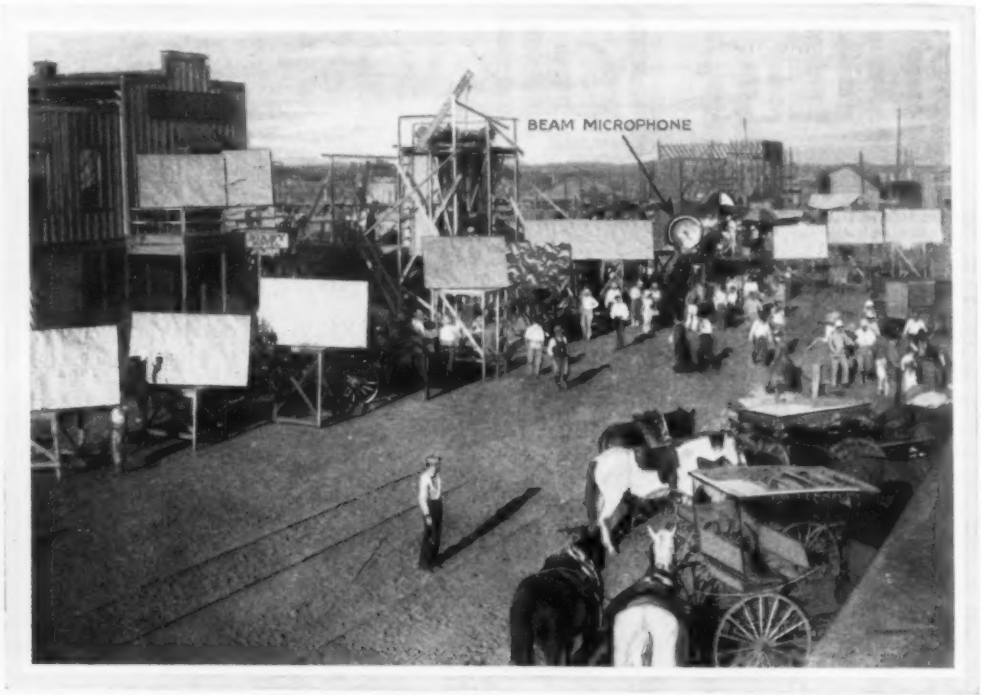
On the lot during the filming of the picture to contain that scene workmen had completed a ten-foot-deep excavation. A brilliant idea occurred to the sound-effects men. Lower a microphone to the bottom of the pit, fill a dump truck with rock and dirt and pick up the noises as the load rumbles seventeen feet down the truck floor into the hole.

Easy, but not complete. Five cubic yards of dirt sliding down a seventeen-foot incline hardly approaches the volume rolled down in a gigantic earth slide. But by making two prints of the sound track, which is assigned a narrow slice along the edge of the completed film, re-recording the doubled volume and, having added a background of noises from "stock" in the studio's sound library, again doubling these, the sounds from the dump truck reached four times their original volume and theatergoers heard a "devastating" land slide that sounded far more realistic.

The talkies are filled with sound tricks. Many are more faithful reproductions than the noises created during the scenes you witness. And the tricks, both of making the noises and applying them to the finished film, require the services of hundreds of sound engineers, sound-effects experts, mixers and assistants of one sort and another.

Not a telephone bell tinkles in a drawing-room scene, not a door slams, until the sound experts have placed their approval on the effect. Unfortunately for these busy technicians, whose lives are one long series of experiments under high pressure, the microphone picks up sounds in many cases with greater fidelity than the human ear. Low notes and high notes drift into the mike, and they must guard against any sound finding its way onto the track which will not stand the test of repeated reproduction.

The thick concrete walls of the sound stages serve at once to protect microphones on sets from outside noises and to provide the background for reverberations of cannonlike explosions. As I



Getting Ready to Take a Scene for "Cimarron"; Note Arrow Pointing to Beam Microphone and the Light Reflectors Adjusted on Set Opposite One to Be Filmed

rounded the corner of a large building on one of Hollywood's largest studios recently, I came suddenly on a sound truck and a group of serious young men engaged in recording the explosions of a series of powder balls. As each quarter-pound of black powder, wrapped tightly in tape, exploded, the noise was recorded in sounds which will boom out on audiences like sixteen-inch naval guns. And that's exactly what they are intended for. A queen, sailing from her seaport capital, will be saluted by her navy. A silent film showing the navy saluting will be rerun, the explosions from the tiny balls of powder added to the sound track at intervals to coincide with explosions of the big guns, and there you'll hear the navy firing its best.

As I sat in the sound truck during the powder explosions, I saw how the mixer brings in the full force of the explosions.

"Ready," he spoke into the phone.

"Okay," came a voice from the scene of explosions. "One, two, three—bang!"

As the bang came, a light flashed through an aperture on the sound machine. As the light flashed, the mixer turned a knob, flooding the apparatus with electricity in order that it would pick up the full energy of the rumblings, reverberations and echoes of the explosions.

Although this is a trick, the Hollywood sound engineers seek to give the public natural sounds, and in many instances improve on nature. Recently one director, in shooting a prison scene, wanted to use machine guns. Blank cartridges "plopped"; wax bullets disintegrated and gave a "blob" effect; pneumatic hammers striking wooden boards failed to give the snap the machine gun itself produced, and machine guns with steel bullets by their sharpness broke the light in the recording machines. Then one of those unsung geniuses of the movie studios devised an electrical shock absorber to stop vibrations of the light globe, and the day was saved. Real machine guns shooting steel bullets sang their songs of death and were recorded and reproduced in hundreds of theaters.

The roaring of an engine heard when a motor cop chases a crook probably was not recorded when the picture was taken. Movie sound engineers do not consider this a trick but rather a necessary means of recording the sound properly and pre-

senting it most effectively for your enjoyment. Here's how they accomplish this effect: First they shoot a silent picture showing the chase. Then they bring a motorcycle inside the studio and make three sound tracks, one recording the steady running of the engine, one recording the motor starting and pulling away from a standstill, and a third recording its entry into the scene and the rider cutting off his engine. On a fourth track, at predetermined intervals, the siren is recorded. After all this is done, they have a sound track much longer than the silent picture showing the chase. Here then they need only cut away some of the constant sound of the motor from the center, work in the two ends and, to get their proper volume, mix the motorcycle and siren noises on the picture film.

The sound engineers face a constant problem of moving their microphones to get as near the source as possible, yet remaining outside the camera range. Thus the mikes are mounted on beams and moved around to follow the action. Sometimes, however, not even this arrangement is adequate, and recently Carl Dreher and other sound engineers developed a beam microphone, used in combination with a mirror which reflects sound instead of light.

The beam microphone resembles a huge searchlight. It is suspended in the center, its open end away from the speaker in a position to receive reflected sound impulses. When a sound hits the concave surfaces of the concentrator, as technicians know it, it bounces off and takes any new direction toward one central point where the mike is located.

"Our business," said Mr. Dreher, "is to reproduce sound naturally and pleasantly. We can make good voices bad but we can't make bad voices good. Since the sound apparatus is becoming more compact and more efficient, we are gradually eliminating overriding background noises and approaching true sound reproduction."

Bringing pleasant noises to the screen involves both the use of sound-recording devices and apparatus for producing those effects. Since the early days of radio when a metal broom beating on a drum simulated steam escaping from a train,

Murray Spivak Playing Tuned Water Pipes; at Left Is a Rain Machine; Steamboat Whistles, in Rear, and Drums, at Right, Produce the Sound of Winds

Laurence Tibbett Singing with Chorus; His Voice and Those of the Others Go through Separate Microphones to a Mixer Where They Are Properly Blended for the Film

the recording of these sounds has become an almost exact science. In pictures, sound effects frequently reproduced are caused by actually employing the same principles as the originals. For instance, the starting of a locomotive when recorded for the screen is done by actually exhausting a column of air through a five-foot-square speaker.

As I explored the storeroom of one sound-effects laboratory, Murray Spivak, who came to pictures through New York orchestras and the radio, pointed out a great heap of junk, whistles, bells and all the paraphernalia that once provided realism on the talking screen. Now they're being packed away in bins, probably never again to be used.

In their place has come new apparatus, the secrets of which are guarded carefully by each director of sound effects lest they fall into the evil hands of his competitors. These wizards of noises gradually bring to the screen natural sounds and they zealously safeguard any new developments.

"In another two years," explained Spivak, "after equipment has been perfected, with few exceptions we will be able to pick up all sound naturally. We are getting closer each month.

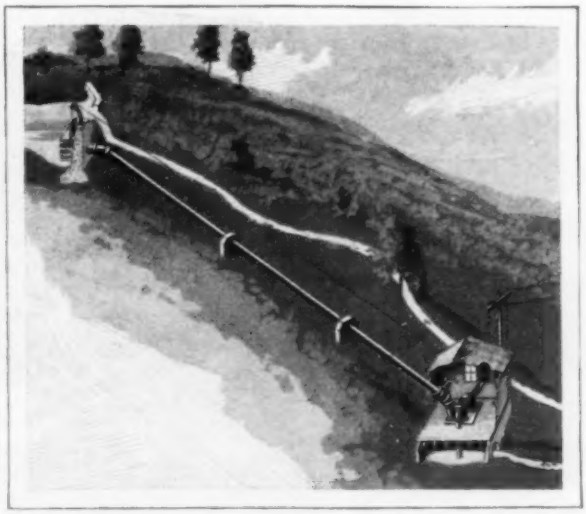
"In shooting outdoor scenes, one of the principal difficulties comes not in registering sound but in preventing some sounds from reaching the mikes. We do everything possible to stop the wind from blowing against the delicate diaphragms. Windshields, sometimes in the form of thin ball-like cloth coverings, save the dialog for its rightful prominence.

"Suppose we are shooting a scene showing a great wave hitting the deck of a boat. The human ear would hear both the impact and the swishing. On the mike, however, the impact drowns out the latter sound and synthetic sounds to take its place are reproduced with water machines.

"Some sounds are difficult to imitate. Voluminous sounds must have large bodies for depth. A cap-pistol explosion never sounds like a revolver shot. Yet from many instruments, such as discarded automobile brake drums that ring like cathedral chimes, we produce for the screen sounds that ring truer than the originals."

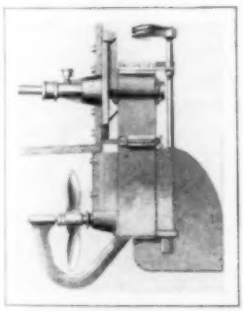
CARBOLOY-TIPPED SAWS FOR LONGER LIFE AND GREATER STRENGTH

Saw teeth now are being tipped with the recently developed alloy, carboloy, to increase strength and wearing qualities. Tungsten carbide has been known for a long time as an exceedingly hard material, but it was not suited for saws because it was not strong enough to withstand vibration. With the addition of cobalt to the tungsten and carbon, however, the resulting product was found to be about half as strong as high-speed steel, and hard enough to scratch a sapphire. Saw teeth tipped with carboloy have shown an efficiency increase of as much as 7,000 per cent in cutting asbestos pipe covering, as compared with a standard saw, and over high-speed steel an increase of 5,100 per cent in the cutting of casein-glued plywood.



Drawing Showing How Small Pipe Line Supplies Enough Water to Operate Hydroelectric Plant

TILTING DRIVE FOR OUTBOARD HELPS PROTECT PROPELLER



Easily attached to the boat, a drive assembly for the outboard motor can be tilted up to a nearly horizontal position for beaching the craft or for passing through shallow water. A chain drive gives efficient power with almost no noise, and when the drive is tilted, the propellers can be changed with little trouble.

MIDGET WATER-POWER PLANT LIGHTS FARM HOMES

Light and power for the farm home or country estate are supplied from a compact hydroelectric plant that requires a comparatively small volume of water and is easily installed. For instance, the smallest size, with a fall of forty feet, will generate enough current to keep thirty-five lamps of twenty-five-watt capacity burning, although the water that drives the wheel passes through an aperture only two and one-half inches in diameter. A special feature of the outfit, and one that is said to make it more efficient than former units of its kind, is the automatic governing device combined with a load-change balancer which make possible practically constant voltage.

LIGHT SOCKET EASILY APPLIED TO INSULATED WIRES

Electric-light sockets now can be attached directly to the strands of a cord connected with an electric circuit without stripping the insulated covering from the wires. These sockets, requiring neither tape nor solder for a connection, consist of two pieces and are screwed together. One section contains grooves in which the wires are placed. When the cap is screwed to this section, two strong pins pierce the insulation and make contact with the conductor. They are weatherproof and are particularly convenient in making illuminating display sets.

Thrills of the

"JUMP for your life!" cries the boss of the log-driving crew, as three of his bold river "cowboys" are threatened with destruction before the avalanche of tumbling, jerking, churning logs riding on the lap of a river rushing at flood-tide.

Only by the narrowest margin did these river hogs escape death as they danced across the bobbing, slippery, barkless logs for the shore.

The first big thaw in the northern forests witnesses the most thrilling and spectacular event of

Above, a River Logging Scene in Northern Quebec; Below, a Tractor Hauling a Train of Logs through the Northern Forest to Have Them in Readiness for the First Thaw of Early Spring

Spring Log Drive

Another River Logging Scene of the North Woods, Showing the Intrepid Lumberjacks Riding the Twisting Mass of Lumber with the Sure-Footed Assurance of a Mountain Goat

the year—the annual log drive. Bands of lumberjacks, way back in the heart of the wilderness, become feverish with enthusiasm as they await the signal, "The river is breaking up!"

Driving the millions of logs down the rivers of the north, now swollen to a mad turbulence by the accumulated snows of winter, and riding the slippery mass on the lap of the flood, requires rare skill and superhuman endurance.

For sheer daring, attained only by years of experience, these rivermen are unparalleled. Whether you watch the big show from a safe vantage point on the bank or get out on the spinning, slippery sticks and flirt with disaster in a hand-to-hand combat with death, you are sure to agree there's nothing like "herding" logs.

Although the mechanical age has contributed greatly to elimination of drudgery in the big woods, by providing powerful track-laying tractors which snake trains of logs from the heart of the forest to the river bank, and a multiplicity of other devices, still the log drive provides the cheapest way of delivering the season's cut to the mills.

The biggest task of the log harvest is performed in the very teeth of bleak winter. Driven by whining gales from the Arctic, the snow in the forest drifts deeper and deeper until it becomes necessary to keep the powerful snowplows moving daily to blaze a way for the log trains. The river, down which the big drive will be made, has frozen with a mantle two or three feet thick. Even at high noon, when it is supposed to warm up a bit, the thermometer seldom registers above zero and often it settles at ten, twenty and sometimes thirty degrees below.

But the enthusiasm of the crews does not lag. If anything, the tempo of the camp seems to increase, since now man and beast alike must work fast to keep from freezing. The crew hop out at four o'clock in the morning; when they reach the scene of the log harvest, it is often too dark to see. They work steadily, with only an occasional intermission for the hastily snatched lunch and repeated

One of the Sorting Gaps in a Quebec Lumber Camp, Where Over 250,000 Logs Are Handled Daily by Experienced Workmen

mugs of boiling-hot coffee. Just as soon as the ice has become thick enough on the river to carry the heavy loads of logs, tractors and teams start transferring timbers from the heart of the forest skidways to the banking grounds on the river ice, where they are carried away by spring freshets. This log-transporting task is not the least dangerous of the many adventures of the lumberjacks.

The logs are loaded on low bobsleds in great pyramidal piles. A layer of six huge timbers is placed on the trucks. Five smaller logs are piled across these to form the next layer; then three, then two, and finally a single log poised precariously on the top. Each timber weighs from 1,000 to 2,000 pounds; each is a potential man killer if improperly handled. The logs are snaked to their place on the pile by block and tackle, assisted by the daring canthook man. The hoisting of each log is a separate problem in applied mechanics in which the slightest miscalculation may result in the crushing out of a human life, or maiming for life. Yet the lumberjacks swarm over the huge piles, active as ants, and the work progresses with surprising speed, without thought for dangers involved.

Once the logs are heaped in place, the sled loads are lashed with great iron chains, and then the teamsters, perched on the top log, skillfully guide their four and six-horse teams to the banking grounds, where the chains are released and the sleds unloaded by gravity.

The picturesque horse is fast giving way to the more powerful and dependable track-laying tractor in most parts of the big woods. This mechanical giant, capable of laying down and picking up its track as it travels through deep snow, is a traveling locomotive which may be operated without constructing a railway to the scene of logging. By means of a windlass, which works as an auxiliary to the tractor motor, logs are picked up and laid down where wanted, and thus the machine plays a dual role in logging operations, introducing a new device and saving human life.

At best, every detail of logging is fraught with peril. Every man knows well that his life depends, not alone on his own watchfulness and dexterity, but also upon the care and skill of his fellows. Even where horses are used, they must be trained to perform their tasks with a high degree of co-ordination.

A sudden, unexpected lurch of one of the block-and-tackle outfits on the loading pile may easily claim the lives of five or six men. The lumberjacks must be on guard every moment of the day. As the result of experience, the members of the crew respond to the commands of the bosses with the alacrity of performers. And the most interesting members are the canthook men, who work in pairs and usually are "bunkies." They must have mutual confidence when the miscalculation of two inches in the swerve of a spin-

Above, a Logging Train in British Columbia Hauling the Fallen Giants to the River; Right, a "Wooden River" during the Annual Pulpwood Drive in Quebec, the Waters Jammed with Countless Thousands of Logs Which Are on Their Way to Be Converted into Paper; Below, Loggers Working at a Sorting Gap Where One False Step May Spell Disaster for the Lumberjack

ning log may smash a comrade like a fly.

Teamsters and tractor operators are at the mercy of the loaders. If the pyramid of logs on which they are perched is improperly loaded, the slightest jolt will cause it to "spraddle out," snapping the heaviest chains like thread, and crushing the unfortunate driver. An equal responsibility rests on the roadbuilders. The slightest inequality may capsize one of the towering top-heavy loads. Water-sprinkling outfits keep the roads as smooth as a parlor floor, with a mantle of crystal ice several inches thick. On the grades, sand is scattered to aid in braking the heavy loads, and often it is necessary to ease loads down steep slopes by use of a steel cable, attached to tree or stump.

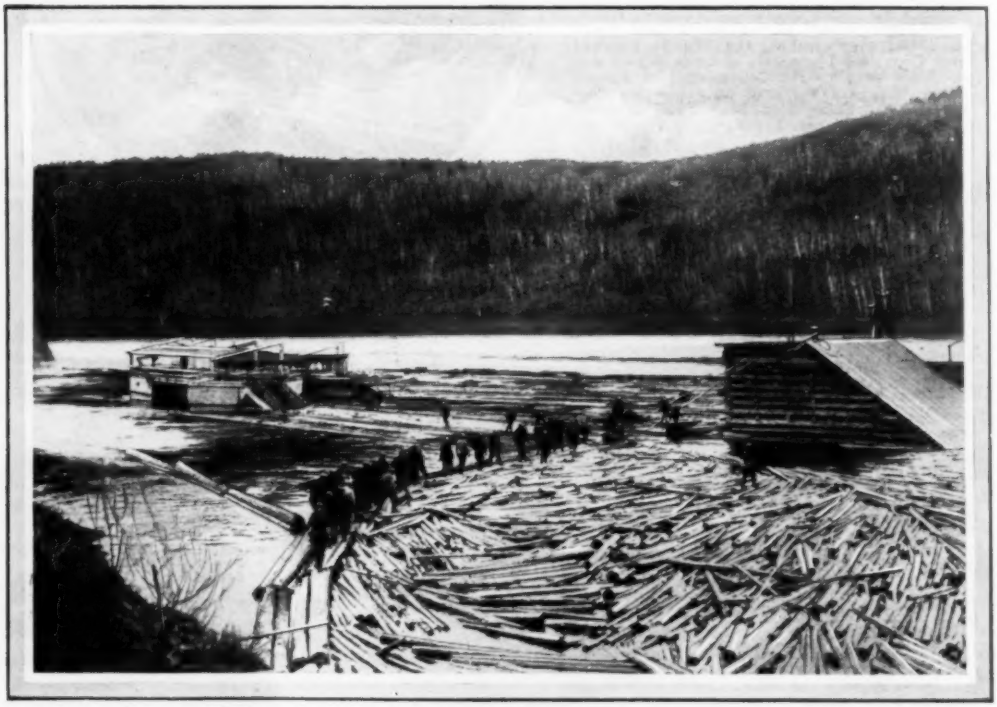
All the delicate, dangerous, complicated operations of the log harvest are carried on by the hurrying crew in a freezing temperature. The men are hoisting uneven logs, often coated with ice. Frequently they are half blinded by flurrying gusts of surface snow. That several accidents mark each season's cut is inevitable; in fact, it is miraculous to the layman that the whole crew is not killed.

Then—three wild cheers—comes the day, late in winter, when the warm sun starts melting the ice and snow. Long, slippery, barkless logs, are rolled down to the river.

Out on the icy surface other teamsters, assisted by canthook crews, snake the logs into high piles with their long steel chains and pulleys. Soon the banking grounds are buried twenty to thirty feet deep with these great piles of logs, packed almost as tightly and evenly as matches in a box.

When the thawing ice finally collapses under this mighty weight, it dams the flow of the river behind the logs until the high water floats the entire mass, when it starts grinding downstream like a mammoth glacier, filling the river from bank to bank. This "wooden river" is the typical American spring log drive, and the most critical of the many processes involved in harvesting our timber supply.

Abruptly narrowing banks or rocky gorges are likely to cause jams, unless the attending river hogs work feverishly to break the tangle before the pressure from behind piles the heavy logs thirty, forty,



A Sorting Boom at Windago, Que.; This Work of Separating the Logs Is Child's Play Compared with the Task of Preventing a Jam and Keeping the Mass Moving

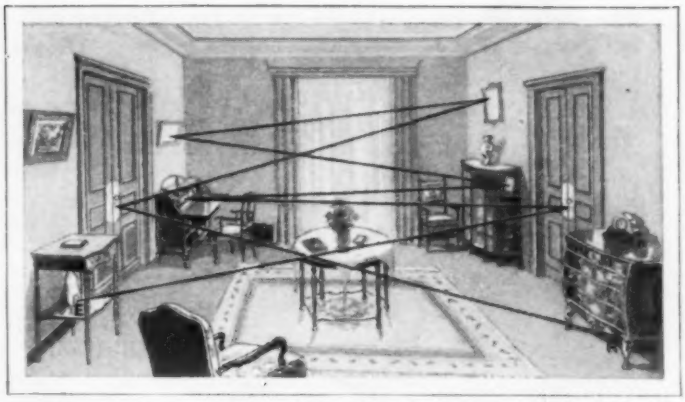
even fifty feet high in an interlocking mass. If the "key log" is pulled out, the jam is suddenly released and will go its way. In olden days, rivermen seemed to have a sixth sense that enabled them to select that key log after an instant's inspection in a rapidly forming jam where the delay of a few seconds might be fatal. If they could pull that log out, they did so, if not, dynamite was used to dislodge it.

Only the most skilled river riders are given the post of honor—and of danger, too—at the vanguard of a drive. It is the duty of these men to guard against jams, or, if they are inevitable, to break them up before the entire drive becomes hopelessly stranded. This is the hardest sort of work. Often the men toil knee and hip-deep in icy water all day.

Experienced log drivers, possessed of the sure-footed agility of the mountain goat, are able to dodge out of danger, even when it sweeps close. Toiling diligently until the last possible moment to break the jam, they wait until the cracking of wood tells them the face of the jam is about to collapse, and then they jump from one floating timber to the next, and finally ride triumphantly ahead of the released flood, thick with tossing logs.

Driving the billions of feet of pulpwood—four-foot lengths of spruce—down the Canadian streams to feed the world news-hungry presses, demands an entirely different type of work than log driving. During the winter, windrows of pulpwood are built up along the streams. When the first thaw melts the snows, these piles are dumped into the raging waters and shot downstream to the paper mills, as toothpicks would bob on angry waters.

Gangs of rivermen follow the drive and keep narrow gorges and rocky projections free from accumulations of small logs. The daring and carefree French-Canadians continually flirt with danger, as they keep the "sticks" moving, and many casualties testify that this is not the safest job in the industrial world.

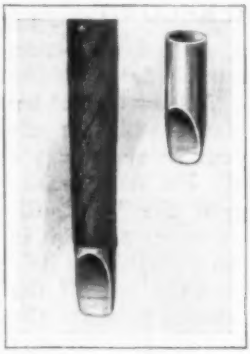


Drawing Showing How Invisible Beam of Light, Crisscrossed by Reflectors, Can Be Used to Guard Entire Room

INVISIBLE CRISSCROSS LIGHT SAFEGUARDS WHOLE ROOM

Crisscross beams of invisible infra-red light are being tested by the French police as a means of protecting an entire room against entry by burglars. A direct beam of the light has been used with success to protect a safe or other place where valuables are kept, but by reflecting the beam back and forth across a room at various angles before it falls on a photo-electric cell, it is possible to guard the whole room instead of a small part of it, as no intruder can enter without intercepting the reflected light at some point, causing the photo-electric cell to close a current which in turn rings a bell or sets off some other kind of alarm.

WOOD MOUTHPIECE FOR CIGAR OFFERS MILDER SMOKE



To provide a milder smoke and prevent the tobacco from coming in contact with the mouth, cigars are now offered with wooden mouthpieces attached. The holder and cigar are made in one unit by inserting the partly rolled cigar in it, and inclosing the holder tip in the outer wrapping.

Squeegee Plates, for Drying Glossy Prints, Coated with Chromium for Greater Durability

PLATES FOR DRYING PICTURES COATED WITH CHROMIUM

Chromium is now being employed as a coating for the squeegee plates used in drying glossy prints, taking the place of the old ferrotype plates. Heavy-gauge spring metal is given a triple coat of chromium. Plates so treated are not affected by heat, fumes, acid or hot water, and once polished with a solution to prevent the prints from sticking, they need no further attention. They give the prints an exceptionally high gloss and are not easily scratched by rough handling.

FOUR-SECOND PLANE TAKE-OFF SETS FIELD RECORD

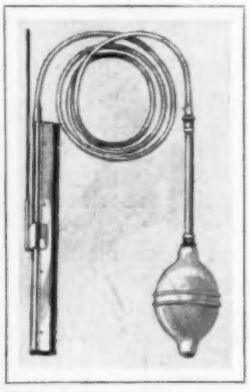
One of the fastest take-offs for airplanes was registered at Roosevelt field recently when Lieut. Alford J. Williams lifted his navy-type Curtiss "Hawk" ship off the ground in less than four seconds after a run of less than 100 feet. His performance beat that of an autogyro, the "windmill" plane, noted for its maneuverability in small spaces. Lieutenant Williams held the brakes on and blew the tail off the ground by directing the blast from the propeller at full speed to lift the rear part of the plane. The ship was the same in which he made his remarkable demonstrations at the air races in Chicago.

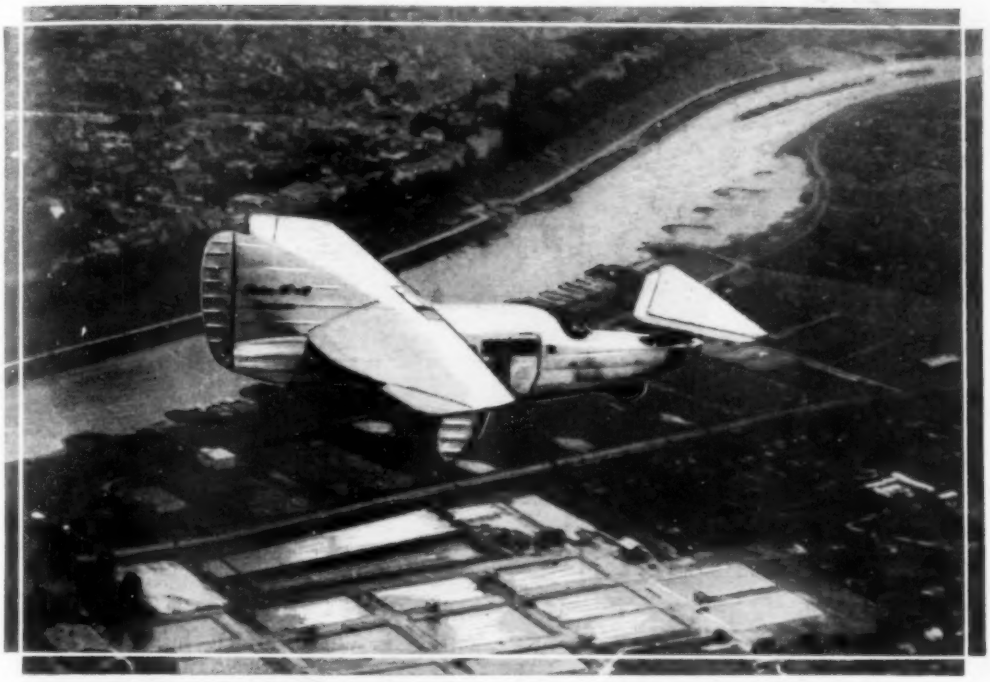
TREASURES OF GLASS SOUGHT IN OLD GOLD CAMPS

Along the trails and in the camps of prospectors and miners who roamed the California and Nevada deserts fifty years ago seeking gold, other searchers today are finding new treasures in the form of old sun-baked glassware, transmuted to objects of art by the alchemy of the sun. As a result of long years of exposure to the sunlight, common glass, hand-blown half a century ago, has been found to acquire a delicacy of tinting in mauve and purple that is considered superior to any manufactured product. Some specimens are delicately etched by wind and sand, and old dump heaps in the back of long-forgotten towns are being searched for well-colored and intact specimens of bottles, dishes and jars. Chemists declare that it is the reaction of impure chemicals in the sand used in making the glass which causes the product to take on the rare tints when exposed to the sun's rays, but it takes at least twenty years for the tints to appear, and only glass made by the old process seems to color. After fifty or sixty years, the colors fail to grow deeper.

WINDSHIELD FREED OF SNOW WITH ALCOHOL WIPER

To keep the windshield clear of sleet and snow in winter, a wiper now is available that uses alcohol for the purpose. The wiper is equipped with a rubber bulb which is filled with denatured alcohol. A slight pressure on the bulb fills a tube which is part of the wiper, the alcohol then saturating a double thickness of felt and melting the snow. One saturation lasts for fifteen minutes in a storm, and the bulb holds a day's supply. In summer, the bulb is filled with water which is sprayed on the felt to wash the glass automatically. For rain it is used like an ordinary wiper.





Airplane with Wing and Vertical Rudder in the Rear and Elevators in Front; Its Odd Design Gives It the Appearance of Flying Backward; the Ship Has Several Unusual Safety Features

PLANE THAT FLIES BACKWARD CALLED SAFEST CRAFT

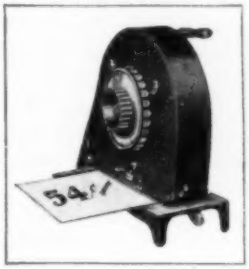
Of such odd and unconventional appearance that it seems to be flying backward when in the air, an airplane built and tested by a Bremen inventor is provided with many unusual safety features. The ship's wing and vertical rudder are in the rear, but the elevators are in the front with the pilot facing them, thus giving the deceptive appearance of backward flight. The inventor claims the craft is almost foolproof.

WATER TANK THAT STAYS HOT FOR INDEFINITE PERIOD

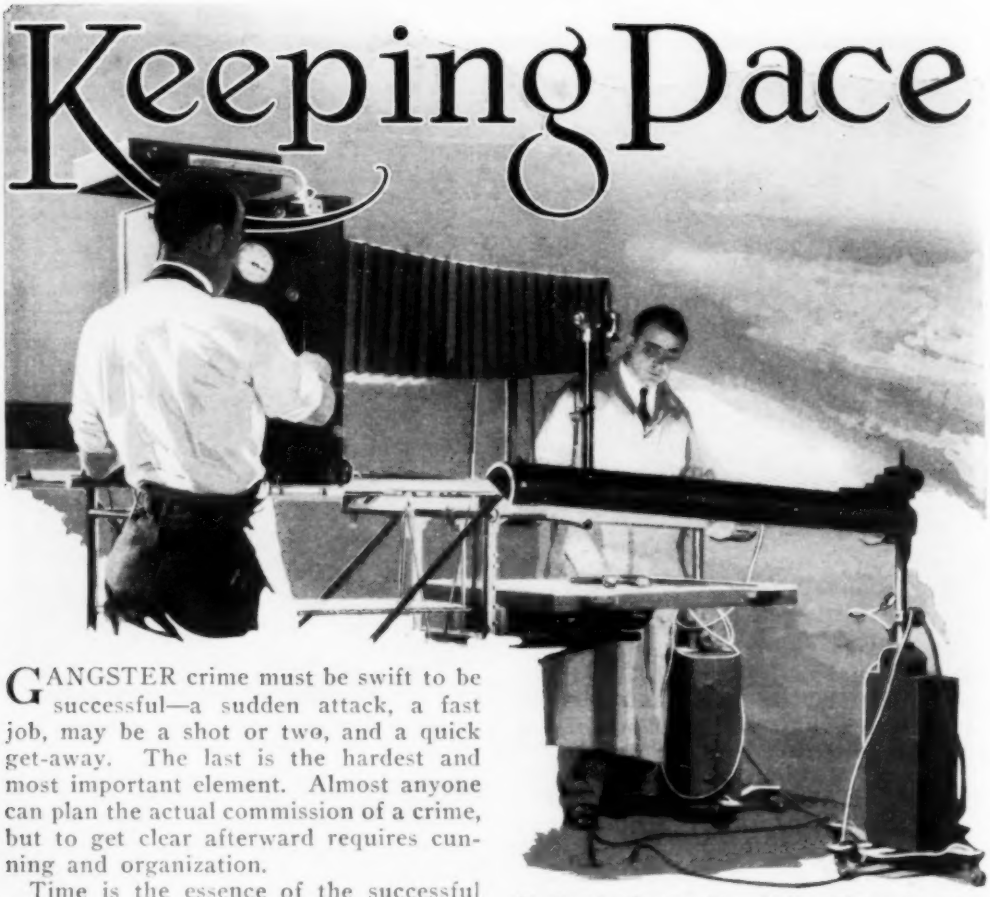
Insulated so thoroughly that it retains heat indefinitely, an electric water heater, once warmed, will keep its contents hot for several days. The water tank is contained in a sheet-iron shell, the space between the shell and the copper tank being filled with layers of asbestos, while spaces at the top and bottom are packed with mineral wool. In tests, water heated to 150 degrees had dropped to only 112 degrees after forty-eight hours. The heating unit is placed in the middle of the tank so that the heat is transferred directly to the water, there being no radiation loss. This arrangement and the insulation both cut down the cost of heating.

CARD-A-MINUTE PRICE WRITER SAVES TIME AND EXPENSE

For the use of stores and shops, a compact price-card writer now is available capable of turning out sixty or more printed display cards an hour. Spacing and inking are automatic, and it prints numerals one inch high and unit characters, such as yard, dozen or gallon, in proportionately smaller type. There is no type or ink to handle, the printer being adjusted by dials to write the required price and unit of measure when a crank is turned.



Keeping Pace



Rectigraph Camera Reproducing Fingerprints from Revolver Found near Scene of a Crime

GANGSTER crime must be swift to be successful—a sudden attack, a fast job, may be a shot or two, and a quick get-away. The last is the hardest and most important element. Almost anyone can plan the actual commission of a crime, but to get clear afterward requires cunning and organization.

Time is the essence of the successful get-away. One acknowledged gangster was heard to boast that, given one half-hour's time of police inaction after a job, all the officers in the state couldn't capture him. Very likely, he could make good on the boast, but it's mighty seldom now that a well-organized department gives the gangster that half hour.

Almost daily, the police are cutting down the interval between the crime and the moment when every last member of the force has been put on his toes by being informed of the crime and for whom to look. A cold trail is a long one, the police know, but the end of a hot trail is soon reached. Machines adapted from commercial use are shortening the trail.

Three o'clock in the morning in a quiet section of an eastern city, Patrolman Donovan, swinging down his beat, sees two skulking figures leave a parked automobile. After a short questioning, he decides to take the prowlers to the station. He is prodding them into the car, when a shot bangs out from a dark doorway. He had missed seeing one thug.

The officer goes down, shot clean through the body. A peculiar shot that. The course of the bullet was just forward of the spine, yet far enough back to miss vital organs; the wound wasn't even dangerous, aside from the shock and loss of blood. As he fell, Donovan jerked his own gun.

His first shot scored a bull's-eye, smash in the center of a gunman's chest. Two more shots, fired as his companions threw the limp form of the wounded man into the car and sped down the street, missed their mark. But Donovan had taken the number of the car's registration plate. The officer from the next beat came running. A householder across the street threw up his window.

with the Gangsters

Accurate Shooting on the Fly Is Required of Officers Who Pursue Gangsters, and Here Is a Mounted Policeman at Target Practice

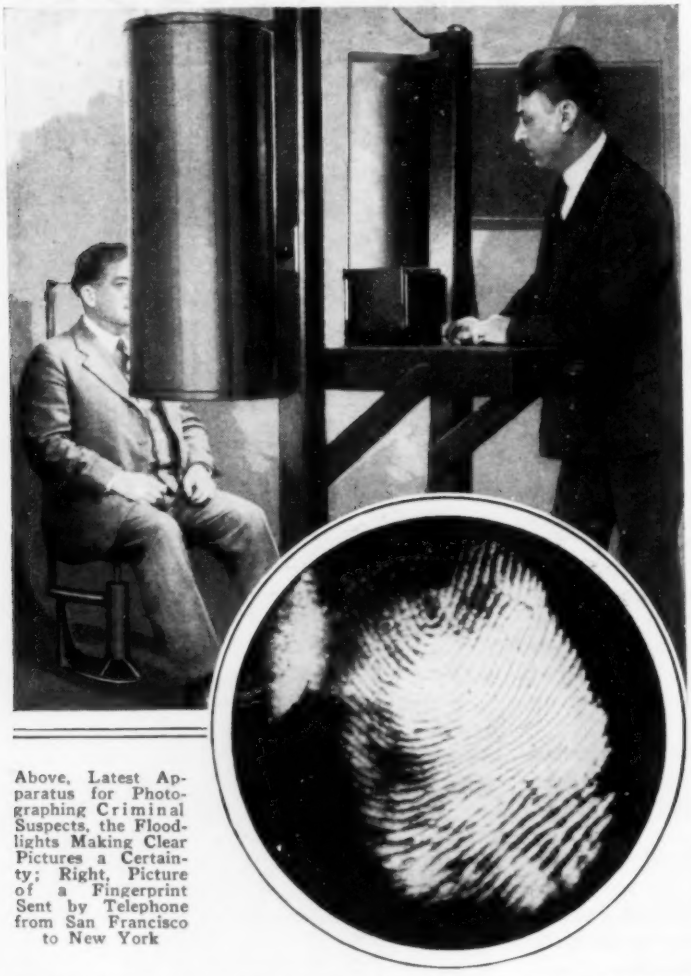
"Get police headquarters on the phone," Donovan directed the inquisitive citizen. "Tell them to get three guns making their get-away in car, license — —. One of them is wounded. Have them send an ambulance for me."

The receipt of the phone call spelled action at headquarters. Instantly, three inside officers stepped to a like number of teletype machines. A teletype looks and is somewhat like a large typewriter; any message typed out on its keyboard is instantly recorded on paper rolls in receiving machines, no matter how far distant, connected to it by electric circuits.

In less than five minutes after the shot had been fired, the twenty-one police stations in the city, headquarters stations in nineteen surrounding towns and eight state-police headquarters had the number of the gangster machine. Thirty seconds later, the blinking of red lights above police boxes all over the city started patrolmen toward them to be given the information. While the net was being spread, twenty motorcycle officers roared out of headquarters to take up the chase.

In the ambulance, on the way to the hospital, Donovan gave his brother officer a description of his assailants. The officer dropped off and telephoned the descriptions to headquarters. Again the teletypes spelled out their messages, and

A Copying Camera Which Is In General Use by Police Bureaus for Duplicating Important Records



Above, Latest Apparatus for Photographing Criminal Suspects, the Floodlights Making Clear Pictures a Certainty; Right, Picture of a Fingerprint Sent by Telephone from San Francisco to New York

again the red lights above the boxes blinked.

Twenty minutes later, a motorcycle officer found the bandit car abandoned, its radiator still hot. From the nearest pull box—all boxes are connected with the district station by telephone—he reported the find. Immediately four fast automobiles, loaded with heavily armed officers, streaked out of headquarters to scour the section. While they were on their way, the motorcycle officer started a tour of the surrounding several blocks.

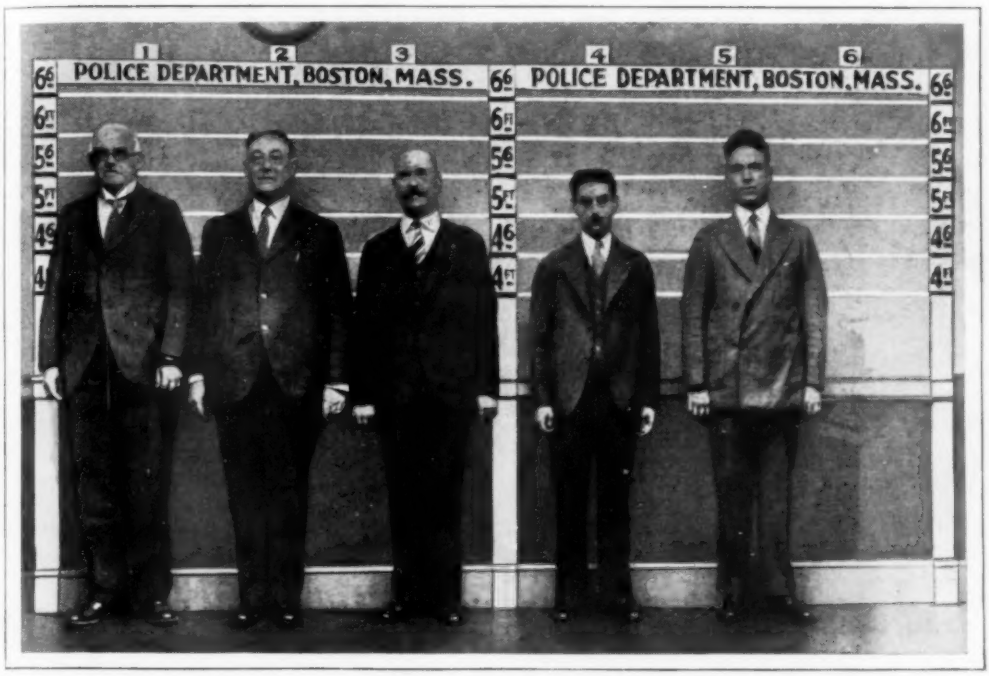
A patrolman stepped from a doorway and hailed him. Three men, one supported by his comrades, had gone into a rooming house down the street a few minutes before. Leaving the motorcycle officer on guard at the front door, the patrolman went to the rear entrance and stayed on watch there.

In a few minutes, one of the patrol cars passed and was hailed. The officers entered the house and found the three men, one dangerously wounded, all of whom proved to have long records for gangster crimes. The elapsed time between the shooting of Donovan and the taking of the trio into custody, was a little over thirty-five minutes.

The teletype is but one of many business machines that the police have seized upon in the effort to keep pace with the gangster criminal. Speed, and then more speed, is their aim; speed in spreading the dragnet; speed in collecting clues; speed in putting the clues in such shape that they will be useful; speed in giving every man on the force complete descriptions of wanted criminals.

Speed! At nine o'clock one morning, without warning, a newspaper reporter telephoned Boston police headquarters that he was somewhere in the city with a red-covered book under his arm; that was the only mark of identification given. He wanted to be shown how soon they could catch him. In twenty-five minutes, by virtue of the teletype, the call-box lights and a score of motorcycle officers, capture of no less than four young men carrying red books was reported from widely separated sections of the city. It turned out that the first one spotted was the reporter.

The telegraph, the telephone, the radio, the automobile and the motorcycle—every one of the familiar means of fast communication and conveyance—were quickly adopted by police departments the country over as they came into general use. The gangsters, of course, use



Boston Police Executives Demonstrating Method by Which Entire Gangs Are Photographed in Groups against a Background Marked in Feet, to Show the Approximate Height of Each One

them too. Radio is being used constantly both by the forces of law and order and their enemies. Rum runners keep in touch with their ships by radio; the coast guard uses the same means to detect landings.

All these aids to speed are spectacular. Behind the scenes operate a number of machines, not so impressive to the layman, but no less efficient for that. The newest of these is the rectigraph camera, which, upon investigation, turns out to be simply a greatly improved form of a machine long of great usefulness in commercial and legal pursuits—the photostat. Watch it function in practical police work.

The police of a New Jersey city caught one of a gang operating in their town. The man had no record there, but the officers found his picture, description and fingerprints in their files on a record card sent to them by the Boston department. A telegram asked for information regarding pals of the jailed gangster. In their index, the Boston police found that the man, besides his individual listing, was shown in a panel photograph with six other suspects known to operate with him. Whenever possible, such gangs are photographed in a group; it makes for speedier work when one mobster is captured and his associates are wanted.

A passenger plane was scheduled to leave East Boston airport for Newark in exactly fifty minutes. The fastest motorcycle driver on the force could make the airport from headquarters in twenty minutes. There was but a half hour in which to make copies of the record cards. The task would have been impossible with the old-style copying camera, still in use at most headquarters bureaus. The rectigraph camera—installations have been made in the Boston, New York and Los Angeles departments—completed the job with time to spare. Instead of using plates or films, that have to be developed, dried and printed as in the copying camera, the rectigraph machine copies directly upon a roll of sensitized paper. The first copy is ready ten minutes after the operation starts.

Large gatherings are the favorite hunting grounds of professional pickpockets. When the big American Legion parade was held in Boston last October, plainclothes detectives were brought in from cities as far away as Chicago. Naturally,

Working in Pairs, Motorcycle Officers Are Trained to Take No Chances in Stopping a Car Believed to Carry Gangsters; While One Investigates, the Other Stands Ready for Trouble

these officers were unacquainted with the faces of the best known Hub "dips," a severe handicap to their usefulness.

In twelve hours, the rectigraph camera turned out 3,800 complete copies of both sides of the record cards of twenty-five pickpockets likely to be operating among the crowds along the parade route. Each outside officer carried with him photographs and full descriptions of the men he might expect to find plying their criminal specialty.

Police departments have been quick to seize upon the transmission of photographs over telephone wires as a means for the speedy distribution of complete descriptions, photographs and fingerprints of wanted men. A robbery was committed in Cleveland. After several hours, the police pinned the crime upon a certain burglar. In the meantime, the criminal had departed on an eastbound train that split at Albany, part of the cars going to New York and the rest to Boston.

Of course, the fugitive might leave the train at any of several large cities where stops were scheduled. The Cleveland bureau turned out a combination photograph of both sides of the burglar's record card and transmitted it by telephone to all these cities. As the criminal left the train at New York, he was picked up on the platform by a detective carrying the telephoned photograph.

WINDMILL IS MOVING HAZARD FOR SMALL GOLF COURSE

Timing of shots becomes an important element in playing one hole of a miniature golf course equipped with a moving hazard in the form of a small Dutch windmill. The object is to shoot the ball through an opening in the mill and to time the shot so that none of the revolving vanes of the little mill is in front of the opening when the ball approaches.

Moving hazards also are being supplied in the form of pivoted or swinging bridges, jack-knife bridges, rotating lighthouses, moving or rotating cups, moving dragon mouths and rotating tenpins. Motion is supplied by a slow-speed motor, giving about nine rotations or movements per minute.

SHOW WINDOWS ARE LIGHTED BY THE PASSER-BY

Shop windows in Paris now are fitted with automatic systems for display lighting, which are operated unwittingly by the passer-by as he nears the display. The system not only attracts wide attention, as the pedestrian usually stops to stare when a dark window suddenly is illuminated as he passes, but also effects a large saving in light bills since the display remains dark except when someone is present to gaze at it.

EGG SEPARATOR SORTS YOLKS AND WHITES RAPIDLY

Handling sixty broken eggs a minute, an egg separator sorts whites and yolks, or delivers the two together with the yolks unbroken. The eggs are fed into the machine and are delivered from a skeletonized rotating platform, the automatic motion, supplied by a small motor, being changed instantly by the operator to a particular action for an individual egg, or any egg can be taken from the machine without interference with its motion. A current of fresh air flows gently over the broken eggs toward the operator, who thus is enabled to detect a spoiled egg. The apparatus is simple to operate, and will effect labor saving in ice cream, candy and other industries.

Egg Separator That Sorts Whites and Yolks at the Rate of More Than Sixty a Minute

Portable Electric Paint Mixer That Stirs a Five-Gallon Can of Paint in a Few Seconds

ELECTRIC PAINT MIXER SAVES TIME AND MATERIAL

Effecting a saving in time, labor and material, a portable electric paint mixer can be used both in the shop and on the job. Old paint that ordinarily would be thrown away can be reclaimed with the mixer, which tints a five-gallon pail in half a minute, mixes any ordinary paint in one-fourth the time, or breaks up and mixes white lead in one-third the time ordinarily required. The mixer with its small motor is light in weight, and is supplied with two brackets, one of which is for the purpose of installation on the wall in the shop, while the other is a portable bracket which can be fitted on a five-gallon pail to hold the mixer.

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

"WINDMILL" PLANE PROMISES VERTICAL FLIGHT

Airplane with Whirling Wings That Are Expected to Act as a Balancing Gyroscope and Lifting Propeller, and Also to Serve as a Sort of Parachute for Descending

Another attempted solution of vertical flight has been offered in a plane with whirling wings that are intended to perform the functions of a regular wing, a balancing gyroscope and a propeller. These wings, four in number, are made of steel cables and covered with airplane linen. They radiate from a central shaft, which is turned by the same engine that operates the regulation nose propeller on the craft, and are connected at the tips by a circular band that surrounds the entire assembly like a tire. According to reports of a test with the experimental machine, it ascended vertically and descended, with power off, at a very slow rate, the whirling wings serving as a parachute in somewhat the same manner as do the rotating blades on the autogyro.

SAWDUST AND SAND RESTORE OIL-WELL PRODUCTION

Ten thousand tons of sand, 700 sacks of sawdust and 700 bags of cement were poured into a well at the Huntington Beach, Calif., oil field when the well's production ceased due to what is known as lost circulation, which means that the bit has encountered a cavern or porous formation permitting the free flow of mud and water away from the drill hole. This mud and water keeps the drill bit cool, and without it, drilling cannot continue. Ordinarily when such a cavity is encountered, a few sacks of cement or sawdust restore circulation, but with this particular well truckload after truckload of material was dumped into the hole before the task was accomplished. The difficulty was encountered at 4,000 feet, and a theory was advanced that it was due to the proximity of many wells, the earth formation being greatly disturbed by the thousands of barrels of oil being pumped out daily.

GOLF-SCORE CARD ON PUTTER AND PENCIL ON SHAFT

To aid the golfer in keeping count of his strokes, a score card is offered which can be attached to the back of the club head, while a pencil fits in a receptacle in the shaft near the head. The cards are intended particularly for putters, since ordinarily this is the club used in completing the hole. For miniature golf courses, putters with a recess in the backs of the heads to hold the card are used, while ordinary clubs can be altered to hold the scorers by placing a small band on the head. The cards can be obtained with the par for each hole printed on them, and with scoring space for two persons.

OIL IS SALVAGED FROM WATER WITH VACUUM CLEANER

One ship on the Pacific coast is fitted with an apparatus to remove and salvage oil from the surface of water in harbors and about piers. It consists principally of an air compressor, several large vacuum tanks, a separator and hundreds of feet of pipe and hose. The vessel sucks in the oil through a hose with an attachment somewhat like the business end of a vacuum sweeper, the entire apparatus working on the principle of the ordinary vacuum cleaner. The oil is separated from the water and used by the vessel for fuel. The ship with its outfit has found particular use in pumping the bilge water from other vessels and in freeing tankers of oil sludge and gas.

NOW YOU CAN TEST YOUR OWN AUTOMOBILE BRAKES

Motorists now can examine their own brakes with a tester which indicates defects on a gauge, making the process almost as simple as determining tire pressure. The wheel is jacked up and the brake tester attached to it by four clamps. The indicator bar is set in its slot and the wheel turned in a forward direction, the gauge reading being taken and referred to a table provided with the tester. This table, together with the knowledge of relative pressure on front and rear wheels as recommended by the maker of the car, shows what is required.

One-Man Brake Tester Which Indicates Defects on a Gauge When Applied to Auto Wheel

Frame Which Makes Easy the Inducing of Artificial Respiration in Victims of Electric Shock

FRAME TO INDUCE BREATHING AIDS SHOCK VICTIMS

Inducing artificial breathing by the old method of placing the victim of drowning or electric shock on his back and producing inhalation and exhalation by alternate pressure and relaxation is hard work, even for an experienced person. A German inventor has made a metal frame which can be operated for hours to restore breathing without undue fatigue, even by unskilled individuals. The victim is placed on the frame which is fitted with a headpiece and a movable section in which the arms are strapped. Then it is only necessary to raise and lower the arm section to induce breathing. In the case of victims of electric shock, where there is risk of heart tremor, the use of a stomach girdle also produces heart massage.

¶Soap was first used to make the hair more attractive, and not for cleanliness.

Up Through the

By E. L. REMELIN

Night Air-Mail Pilot

NORTH from Fresno roars the night-mail plane, blue flames streaking from the exhausts. Beneath the plane, increasing in thickness, a white mantle of fog hung low over the ground.

The pilot, having set his course for Oakland, held the ship's nose on a line for the airdrome. Meantime, through the earphones attached to his leather helmet, came signals, voice signals, informing him of the weather ahead.

"Heavy fog, ceiling 400 feet," the voice told him.

This was nothing new. The pilot continued on his course. Weather conditions at Oakland did not change. Little more than an hour after the plane had left Fresno, the voice from the ground came through even more clearly. The plane was approaching the airport, separated from the ground by an "ocean cloud," as weathermen term the fogs that roll in from the Pacific, 5,000 feet thick.

These heavy fogs hold no terrors for the night-mail pilots now. We have radio sets through which an observer on the ground can direct our movements as safely as though we were gliding down to the field on a sunlit afternoon.

"How's the ceiling?" the pilot asked.

"Ceiling 400 feet, visibility good," the lookout replied.

"Be there in six minutes," the pilot said.

Six minutes later the lookout heard the plane's 525-horsepower motor roar over hangar five, as the plane flew west toward San Francisco bay.

"You're directly overhead," spoke the lookout into an ordinary telephone transmitter. And through the fog and into the pilot's earphones came the report.

"Okay," he replied.

Then the pilot flew nearly seven miles due west, the wheels of his plane clipping the top of the fog bank. At that point he banked and circled, pointing his propeller directly toward the field. Down he glided, and a few minutes later his ship became etched against the lower edge of the fog as brilliant lights swept the field. Through the mile-thick fog, led by the voice from the ground, he had guided the mail plane with a clear space only 400 feet

Soup

deep in which to maneuver for a landing. While not all our flying is done under these conditions, occasionally this scene is re-enacted.

Ten months ago not even a night pilot—one of the species popularly thought to dare anything—would have attempted this feat. Today it has become routine flying. Up through the "soup," sometimes hundreds of miles without sighting land, down through a thick fog to land safely and surely at midnight on a smooth, brilliantly lighted runway, we fly.

Right around the clock, so perfectly do our two receivers and one transmitting set on each plane perform, the pilots talk with the ground stations. The sets are located in a storage compartment im-

Above, Co-Pilot of an Airliner Using Microphone and Earphones to Receive Directions for Landing in Fog from Ground Man, Below

Above, Mast on Plane with Wires Leading to Wings over Which Pilots Talk; Right, Air-Mail Course Laid Out in Sectors to Simplify Location

mediately behind the cockpit. We tune them by turning "coffee-grinder" dials that are connected with the sets. Earphones and mouthpieces are strapped to our helmets.

Every ten minutes, fog or no fog, we "ring in." Each pilot is allotted a certain time, and he must be ready on the second to talk; otherwise he may interfere with another pilot somewhere between San Diego and Seattle and Aurora, Ill. Across the continent, in both directions, pilots regularly report their positions and safety.

Along the Pacific coast we can hear the ground stations from Chicago to Canada. The pilots' calls can be heard 200 miles away. Each plane carries two receiving sets, one to hear company stations and one to get weather reports.

Suppose you fly up the coast with me in the plane "Baker." I take off from San Diego at 10:15 p.m. Two minutes later comes my turn to report. I'm on the air: "Remelin northbound, Baker, calling San Diego. Over Ryan field."

"Okay," sings the operator on the ground below.

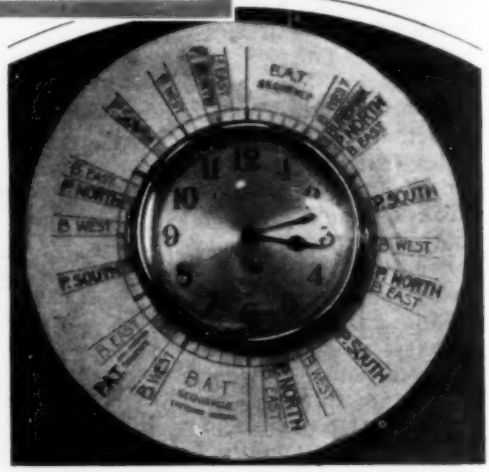
Ten minutes later. I am due again on the air. Here it goes: "Remelin northbound, Baker, calling San Diego. Fifty-five hundred feet over Miramar beach. On top of fog. Okay."

But, wait. This has been changed. Sometimes messages such as this become "mushy." Miramar might sound like any of a dozen small towns in southern California. Radio is sound and efficient, but vowels and consonants often are garbled. We pilots have become human buzzers.

Let's go on north of Los Angeles. I take off from the airport at Burbank, and sail toward Bakersfield. Regularly I report until, some forty minutes later, interference garbles my message. Then: "Remelin northbound, Baker, pause dah dah dah dah dah dah pause dah dah okay."

What do these dahs mean? Two things: transmission poor and I'm ten miles east of my course at Lebec.

C. Eugene Johnson, pioneer mail pilot and opera-



Synchronized Clock Showing Time at Which Various Pilots Are Ordered to Report Location

tions manager for Pacific Air Transport, recently worked out a system of reporting by sectors. Along the entire route from Los Angeles to Seattle the line is laid out in squares. When transmission is bad and dispatchers cannot understand the pilot, he sings his dahs into the mike. Thus Willows, Winters and Williams, three small towns in the same vicinity, will not be misunderstood. Each sector is ten miles square. Lebec is the center of No. 6. The first number reported refers to the main on-the-line sector, while the second one refers to an off-the-line position, another ten-mile square paralleling the main line. Thus "dah dah pause dah" means the plane is ten miles west of sector No. 2, while "dah dah pause dah dah" means it is ten miles east of sector No. 2. Evens are east and odds west. Very simple and easy to work.

Above, Earphones and Mouthpiece Built in Helmet; Left, a Mail Plane in Fog over Oakland

And so, on through the night until the plane reaches its terminus, pilots may report by sectors and no one possibly can misunderstand their positions. Should one go down or become lost, the dispatcher will know within five miles of where he disappeared.

Flying up and down through fog, guided by the unseen hand of radio, is an unusual feat but not at all sensational. We think nothing of this form of flying now. In the west we have no radio range beacons to guide us accurately from field to field. We must navigate with our instruments, then follow a voice as its messages sing in our ears.

We rely implicitly on the judgment and advice of the ground man. Recently Harry Crandall, flying south from Seattle, was heard at the Oakland airport when he was four miles southeast of the field. High above the fog he had overshot. Little wonder, with a 4,000-foot fog blanket shutting off ground lights. During the last four or five ten-minute sequences, the ground observer had told him the exact conditions at the field. When finally the plane's engine was heard, Crandall was told to turn back in the direction whence he had come. At last he was heard over the radio hangar. As he flew directly overhead, the voice from the ground reported, "over hangar five." Then he flew west far enough to insure a proper gliding angle back to the field, and plunged into the midst of the thick fog. Down he came, crossing the port line two minutes later.

What's next in radio for fog flying? We now carry three sets, and a fourth for another wavelength is planned. In 1,250,000 miles of flying, our planes have had only four forced landings, caused by mechanical troubles. We're safer than those who stay at home.

Slot Machine Which Delivers Ice Cream When Coin Is Deposited; Electricity Keeps It Cool

ROBOT DISPENSES ICE CREAM WHEN COIN IS DROPPED

Coin-in-the-slot ice-cream machines that are electrically refrigerated have been installed in some New York skyscrapers. Instead of making a trip to the street for refreshments, office workers need only walk into the hall, drop a coin in the slot machine and receive a wrapped carton containing the cream and a spoon.

INSECTS FLY IN "REVERSE GEAR" GO SIDEWISE AND HOVER

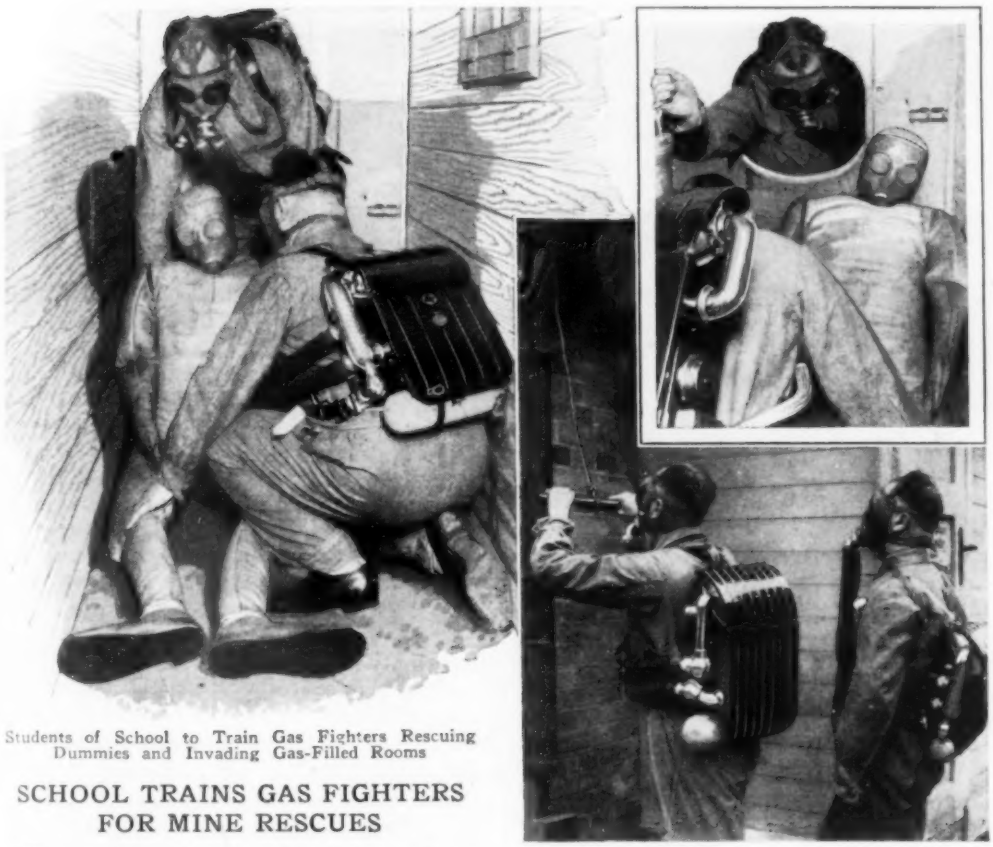
Dragonflies, bees and other insects can fly backward without altering the position of their bodies, they can dart to the right or to the left in a horizontal plane or remain stationary in the air, even against a slight breeze, hovering in perfect balance by rapid motions of their wings. Man has been able to surpass the birds in some respects in his flying, but the mystery of insect flight remains a baffling one and some experts have suggested that discovery of the secrets of the dragonflies, and other species, might aid aviation. How do the insects keep their balance? In certain varieties with limited flying ability, sense organs that doubtless aid them in keeping their equilibrium, have been found, but no such organs have been discovered in some of the more expert flyers. It also has been suggested that an automatic balance is achieved in some way through the eyes, but a butterfly whose eyes had been blinded by a coating of glue and powdered charcoal, had no difficulty in flying on an even keel, while another butterfly of the same species, the swallowtail variety, flew evenly after its head had been amputated. In hovering, it is believed that an insect must move its wings approximately in a horizontal plane, creating a region of decreased air pressure above the body but not in front of it.

TRACTOR USED TO TRIM TREES WITH EXTENSION SAW

Tractors are used to perform many farm jobs, but an Iowa farmer recently found his useful in trimming 100 maple trees. With odds and ends of machinery he constructed an extension sawing rig with which he was able to top a tree ten inches in diameter and seventeen feet from the ground in about a minute and a half. When trees were straight, a rope was tied about the portion to be cut so it could be pulled away from the tractor,

Tractor and an Extension Saw Being Used to Trim Trees; the Outfit Does the Work Speedily

but when the trees leaned, this was not necessary.



Students of School to Train Gas Fighters Rescuing Dummies and Invading Gas-Filled Rooms

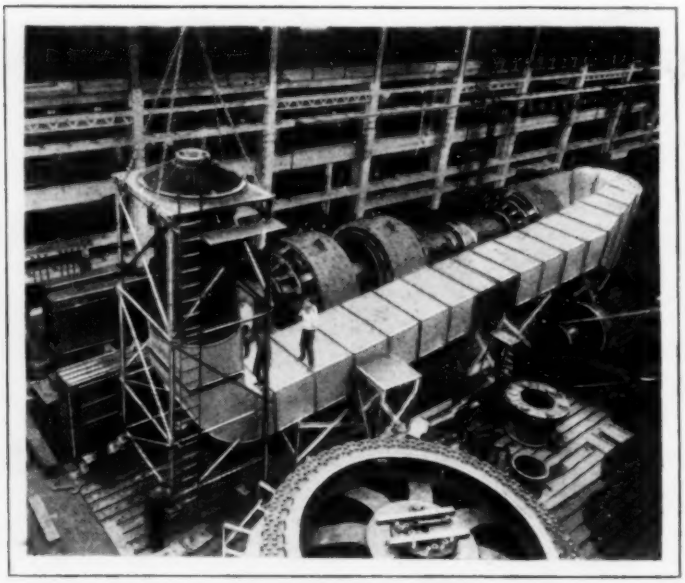
SCHOOL TRAINS GAS FIGHTERS FOR MINE RESCUES

Recent mine disasters in Germany have cost so many lives that makers of gas masks have turned their attention to improving the safety masks to meet the varying hazards of modern industrial life. At one factory near Berlin, a school has been opened to train rescue crews in invading gas-infested chambers to aid the victims of such accidents. Experiments are made under varying conditions, different types of masks being worn by the operators in the tests, which include the rescue of dummies from rooms filled with poisonous vapors.

METAL RARER THAN PLATINUM OBTAINED BY ELECTRICITY

One pound of indium, one of the rarest of metals, has been produced at Cleveland by an electric process. This amount is valued at $7,000, nearly ten times as much as platinum. It is a white lustrous metal, very soft and ductile, slightly heavier than zinc, and can be melted with a match. Hitherto it has been mostly a laboratory curiosity, because it was so expensive to produce, but metallurgists now predict that commercial uses will be found for it, and it has already been employed as a bearing metal, and has been mixed with another metal, gallium, to make an alloy for fused-quartz thermometers measuring temperatures up to about 1,800 degrees Fahrenheit. Indium is obtained by electrolysis, a current being run through a solution containing it and causing it to separate. Accurate temperature controls and the use of proper kinds of electrodes are essential. The first pound of the metal came from many carloads of crude ore. It is rather widely distributed in minute amounts in most zinc blendes, and in some tin ores.

¶ One-fourth of the workers in the United States are engaged in lines of industry and service that were not known thirty years ago.



Giant Fan Which Shoots a Blast of Air Equivalent to That Displaced by Ten-Car Train; It Is Being Used in a Steelmill

A TRAINLOAD OF AIR A MINUTE COOLS POWERFUL MOTORS

Principles developed from a study of aerodynamics are incorporated in a giant fan completed recently at the Westinghouse Electric plant in Pittsburgh. When lowered into an air duct and connected, the blower can shoot a blast of air equivalent to that displaced by a speeding ten-car train. During tests this rush of air cooled the most powerful motors ever applied to a single pair of rolls in a steelmill. The practical application of facts learned from a study of airplanes nearly cut in half the power required to force this quantity of air through the duct.

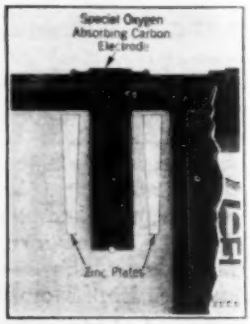
REFLECTOR CASTS LIGHT RAYS WITHOUT SHADOWS

Permitting the regulation of light to the side walls of narrow halls and corridors without a glare in the eyes, a reflector with a perforated reflecting surface now is available. Light is directed according to the number and size of the openings in the sides and the manner in which the reflector is turned, thus permitting the light to be directed toward any point where it may be most desired.

CONDITION OF BONE TELLS QUALITY OF STEAK

Tender steak can be selected by the appearance of the bone. If the bone is smooth and hard, the steak is from a cow, and if it is largely honeycombed, with much gristle, it is from a young animal. The chine or backbone, when split in half, is the best indicator of age. Up to a year it is practically all gristle, but as the animal grows older, the gristle changes and after four years becomes smooth on the split.

AIR-CELL BATTERY FOR RADIO HAS CONSTANT VOLTAGE



Air-cell A-batteries for the radio offer several advantages over dry cells, one cell under test giving the equivalent services of thirty-six dry-cell batteries. The air cell also maintains a practically constant voltage throughout its life, and receivers, designed to use the new battery, require no filament rheostats or other voltage-regulating devices. Such a battery will operate for 1,000 hours or more, the voltage delivered to the tubes through a fixed, non-adjustable resistor remaining within the narrow ideal operating range for this entire period. Heretofore oxygen has been supplied to batteries by adding chemicals to the cells.

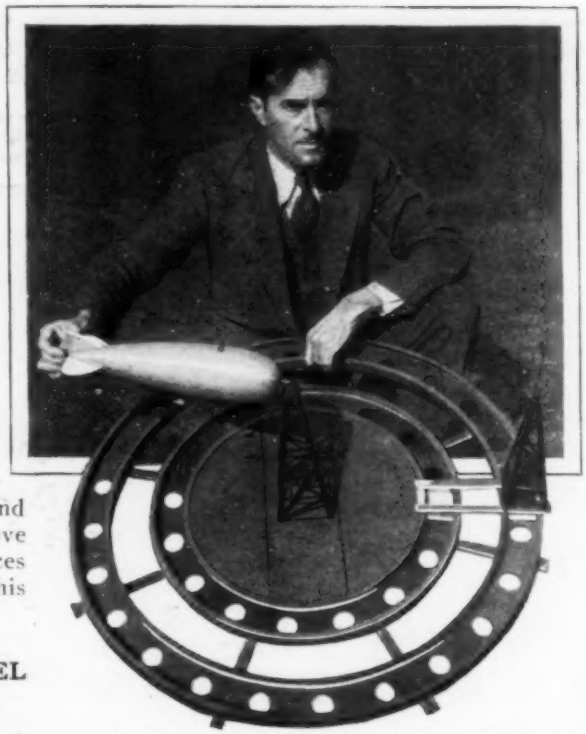
IS IMPROPER DIET CAUSE OF ATHLETES' SHORTER LIFE SPAN?

Eating the wrong kinds of food, not strenuous exercise, is the chief reason why some college athletes do not live as long as their more sedentary brothers, according to an eastern authority. In his opinion, athletes, through application of better knowledge as to the effects of various kinds of food and by carefully regulated diet habits, will live even longer than the average person. In general, reduction but not exclusion of highly concentrated foods, especially starches and sugars, and the use of more vegetables and fruits, are practices that will improve the health and increase the chances for long life of most individuals, this authority believes.

BODY OF TRUCK STAYS LEVEL ON AN UNEVEN SURFACE

No matter how rough the roads or what obstacles are in its path, a six-wheeled truck whose body always remains level has been tested in England. This ability is due to the peculiar construction of wheels and axles, which allows the wheels to give in all directions, while, at the same time, always maintaining contact with an uneven surface of a road or a rough field without affecting the stability of the vehicle.

The Wheels of This Truck Accommodate Themselves to Uneven Road Surfaces While the Body Remains Always Level



Model of Fore-and-Aft Mooring Mast, One Section Moving on a Track; Its Height Is Adjustable

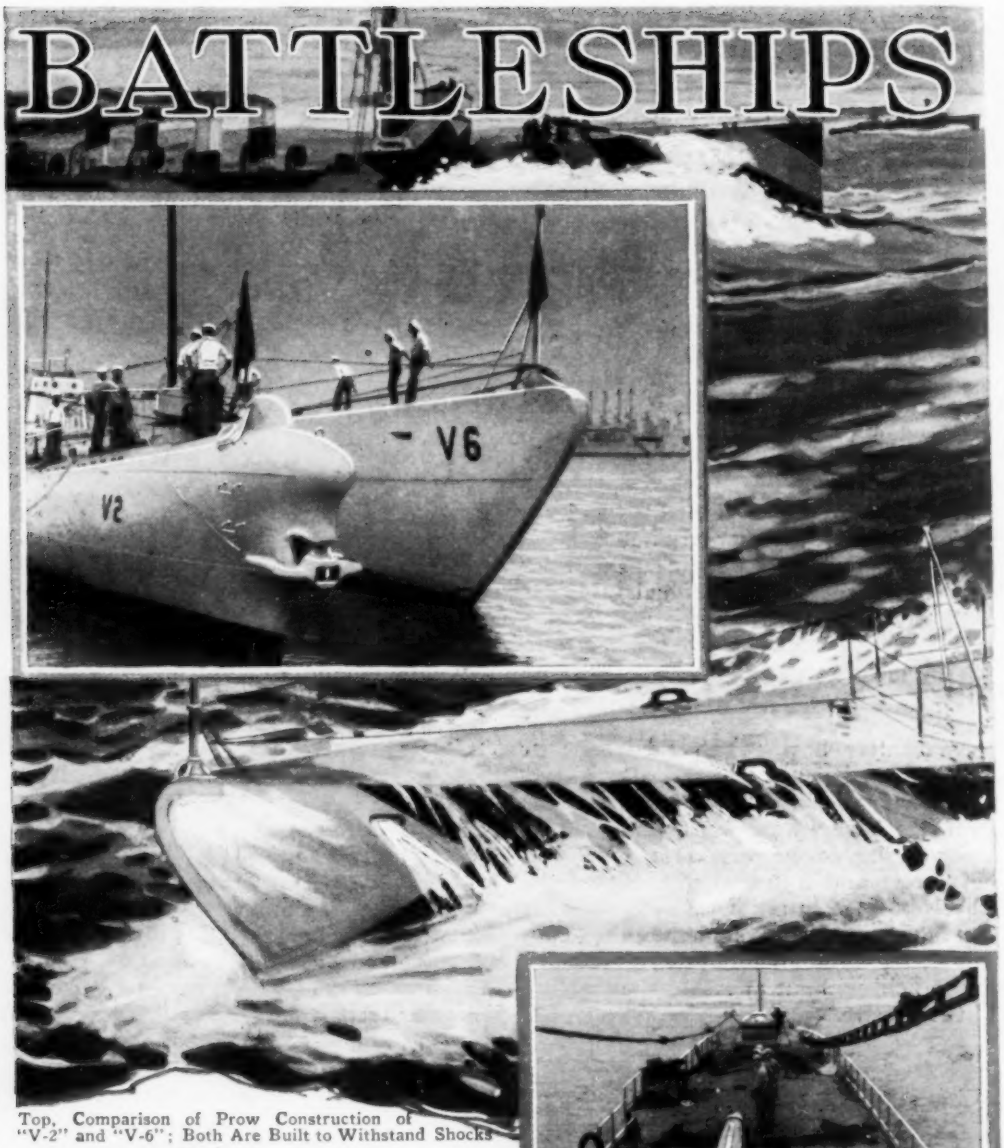
FORE-AND-AFT MOORING MAST FOR BIG DIRIGIBLES

Using a system of fore-and-aft fastening, a working model of an electrically operated mooring mast for dirigibles was demonstrated recently by its Los Angeles inventor. One of the masts moves on a circular track and is controlled by a vane which keeps the ship's nose into the wind. Adjustable masts allow the ship to be lowered or raised.

MORE DURABLE COVER FOR NAVY AIRSHIP

Fabric covering for the giant dirigible "ZRS-4," being constructed for the navy, will be about the same as that used on the "Los Angeles," which, after seven years' service is seventy-two per cent intact. Certain recent developments will be employed to produce what is expected to be an even more durable envelope.

BATTLESHIPS



Top, Comparison of Prow Construction of "V-2" and "V-6"; Both Are Built to Withstand Shocks

By ANDREW R. BOONE

ON THE BRIDGE of the "V-4," one of Uncle Sam's new giant submarines and only underwater mine layer in the American navy, Lieut. Com. W. M. Quigley was bringing the big boat into harbor.

"Ahead two thirds," he called to the quartermasters.

"Starboard engine ahead two thirds, sir," sang the first.

"Port engine ahead two thirds, sir," echoed the second.

Silence as the behemoth slipped through

Looking Aft from Conning Tower of "V-4"; Cable at Right Protects Tower from Nets in Ocean

under the SEA

When on the Surface, the "V" Boats Are Equipped to Put Up a Real Fight; Two Six-Inch Guns Are Mounted on Deck

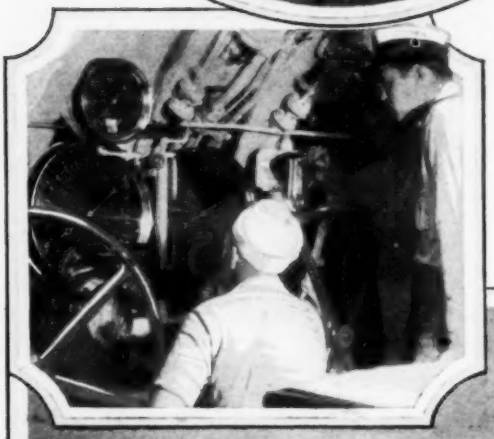
the water. The captain kept his eyes trained on other vessels as the "V-4" moved toward her berth.

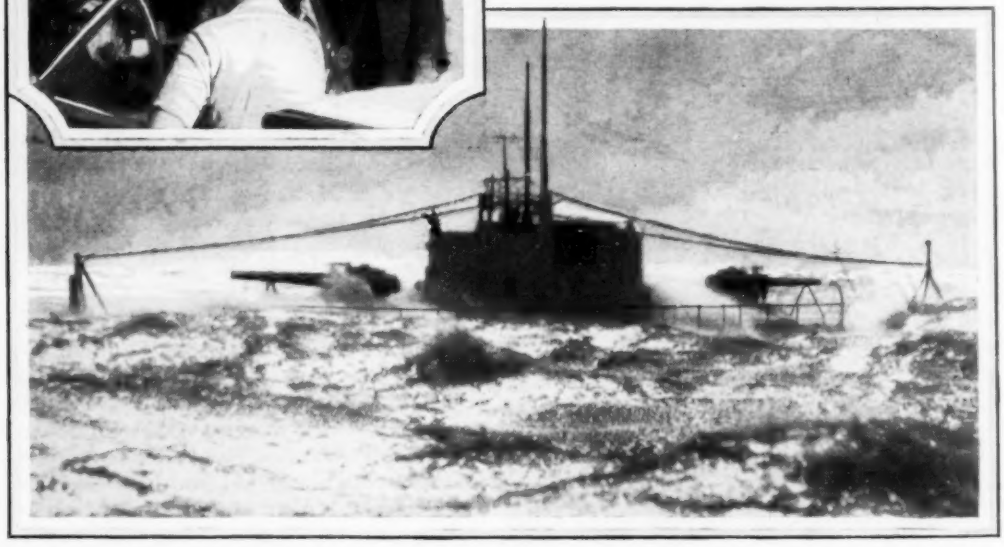
"Ahead one-third," he directed a few minutes later. Again came echoes as the quartermasters turned knobs that sent electrical signals to the engine room, and the helmsman turned the wheel that sent the big sub in a new direction.

Ahead and behind the conning tower, the broad deck stretched, giving to one standing beside the captain the impression of a battleship's deck, so long and so broad is the sub. Two guns, ready to shoot six-inch shells at a target, point forward and aft from mounts on the deck.

Again all was silent until Commander Quigley gave the final order "stop!" and sailors on deck passed lines to other sailors on the "V-6," largest of Uncle Sam's underwater fleet. The submarine had come to rest alongside another, both of which nestled near the bosom of their mother ship, the U. S. S. "Argonne."

These new giant subs, 380 feet long,



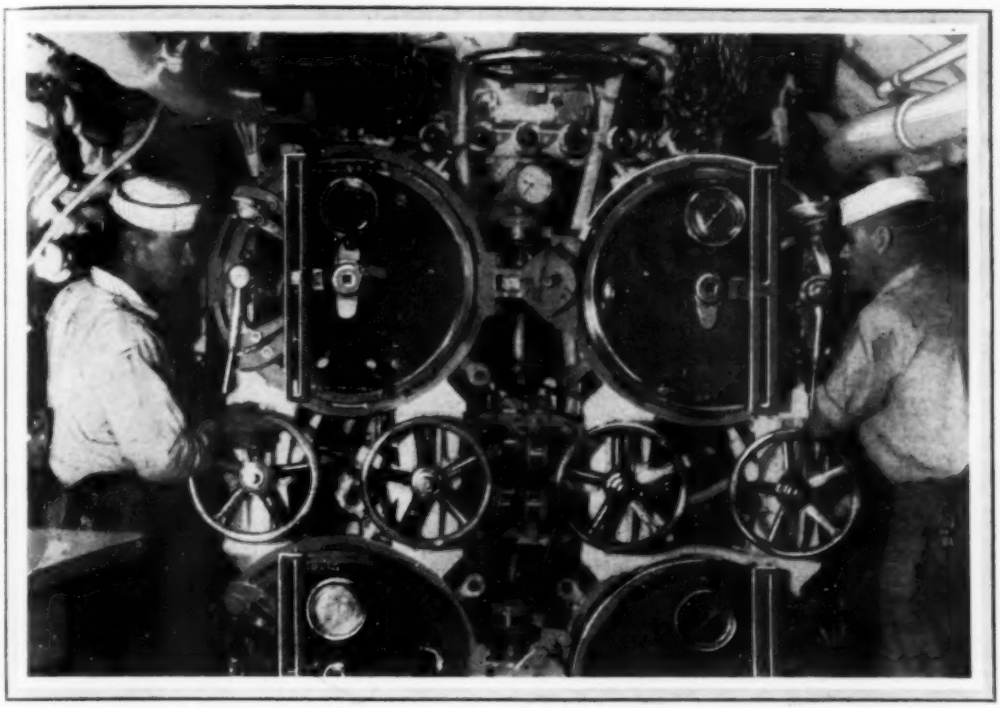


perform silently as they go about their peace-time business of training crews for emergencies. They practice alone and with the battle fleet, firing dummy torpedoes, dropping globular mines from the stern while only periscopes break the surface of the Pacific with tiny ripples, and again training the powerful deck guns on moving targets to test the skill of the gun crews.

When these "V" boats —of which there are now six—leave harbor, they run on the surface until ready for "war games." Such is their size and weight that two officers and four men normally stand in the conning tower to direct their movements.

Powerful Diesel engines connected with twin propellers drive these boats along the surface while storage batteries containing 240 cells—each cell weighs a ton—furnish electricity to propel them when submerged. The "V" boats dive just as do other submarines, excepting that all valves for flooding the tanks and expelling

Top, Looking through Periscope of American Submarine; Center, Intimate View of Depth Gauge during a Dive; Below, Conning Tower and Guns of "V-5," Just as the Boat Was Going Down



This Is a View of the Business End of the Torpedo Tubes of One of the Large Submersible Boats; This Intricate Machinery Contains Four Torpedoes in Position to Be Fired

water from them, may be turned by a single officer in the control room, and so swiftly do they operate that in one minute 270,000 gallons of water may be forced into the two main tanks as the sub disappears beneath the waves.

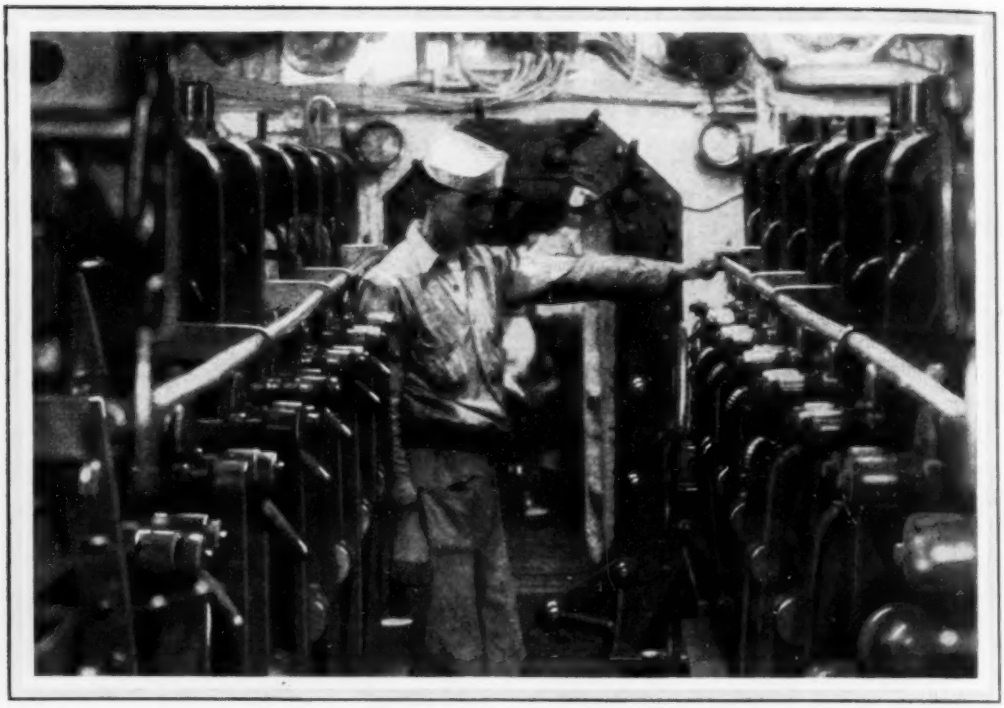
In these "disappearing battleships," as some of the crew call them, the sailors find luxuries and spaciousness of which none on the older and smaller boats had dared to dream. Three decks—the bridge deck, superstructure or gun deck, and the main deck, on which are located the living space and all operating stations except the torpedo room—permit them to move around with the ease of a battleship crew.

Nothing is left to chance in forcing a "V" boat under the ocean. Signals indicate the angle of descent, lights on a panel inform the diving officer whether all of the hatches are closed, an automobile horn warns the crew when a dive or descent is about to commence, and electric signals carry orders constantly from bow to stern.

Navy experts long had dreamed of a submarine that could take its place as an arm of the fleet and operate with the fleet on even the longest cruises. This has been achieved through recent increases in speed and range applied to the "V" boats. The thought of submarines being attached to the fleet is not new. However, until recently they have been unable to operate with the battle fleet. The new underwater battle cruisers can make a speed of twenty-one knots, which rivals that of the U. S. S. "California," flagship. German submarines during the war reached a maximum speed of eighteen knots.

The chief development in American submarines since 1918 has been in reliability. Recently the "V-5" demonstrated it could descend safely to a depth of 332 feet, a record for even the biggest subs. The "V" boats carry five or six-inch guns, two to each boat. While the submarines are battleships under the sea in that they carry great destructive power in the form of torpedoes and mines, on the surface a single shot would render one useless.

The early ideas of submarines were conceived in foreign countries, but in reality the submarine is an American invention. In 1776, David Bushnell, a Yale undergraduate, constructed his "turtle boat."



Here Is a Close-Up of the Heart of a Large Submarine; in the Cramped Engine Room These Giant Diesel Engines Propel the Craft When Running on the Surface

It held only one man who acted as captain, crew and power plant. The boat's offensive power consisted of a torpedo which was merely an oak block containing 150 pounds of black powder exploded by clock mechanism. The operator had the simple task of propelling his vessel to the target, screwing the torpedo to the wooden hull, setting the firing mechanism and withdrawing to safety.

From the chaos of chronic disappointment sprang the first practical submarine torpedo boat, the "Holland." This fifty-three-foot boat, powered with a fifty-horsepower gasoline engine, appeared in the late seventies. Since the days of the "Holland," submarine progress has been slow but definite. Today's craft can carry a crew of 100 men from San Francisco through the Panama canal to New York and back again without assistance.

ELECTRIC WIRES KILL BIRDS IN INCREASING NUMBERS

French bird lovers are predicting the gradual extinction of bird life in that country unless some measures are taken to protect them from electric wires and power lines where thousands of them are electrocuted. Often flocks of birds are found dead under these wires, many of the larger ones being killed when a hasty landing sways one wire against another. The greater toll is being taken where electric wires have not been placed underground.

BUG TRAP WITH GLASS SIDES SKIDS INSECTS INTO OIL

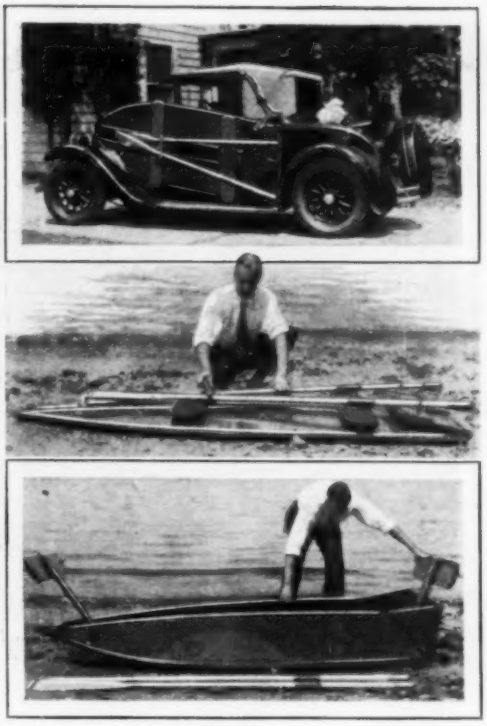
Insects are caught at night in large numbers in a recently invented bug trap that skids them into an oil bath. The trap consists of a wire frame in which four panes of glass are set at an angle. Inside the glass inclosure is a light to attract

the insects, and below is a pan containing crude oil or some other liquid to kill them. The bugs fly toward the light and are caught on the panes of glass, skidding downward into the oil when they lose flying speed.

ELECTRIC EAR DETECTS KNOCK IN AUTOMOBILE MOTOR

Radio is now helping control the anti-knock qualities of gasoline. A microphone and vacuum tubes, magnifying sounds a hundredfold, have been combined with other delicate instruments to form an electrical ear that detects the faintest knock in a motor, yet remains deaf to other engine noises. The apparatus was developed in the course of research for a new type of gasoline when scientists were unable to find a sufficiently delicate instrument capable of interpreting engine sounds. In operation, the microphone is suspended from coiled springs near the engine. Sounds that could not be heard by the human ear are picked up by the electric one, then the rest of the apparatus selects and magnifies the knock and registers the sound intensity on the dial of a meter. Filters screen out the ordinary engine noises, allowing only the knock to pass through the vacuum tubes.

Using the Electric "Ear" to Test a Motor; It Picks Up the Knock but Cuts Out Other Noise



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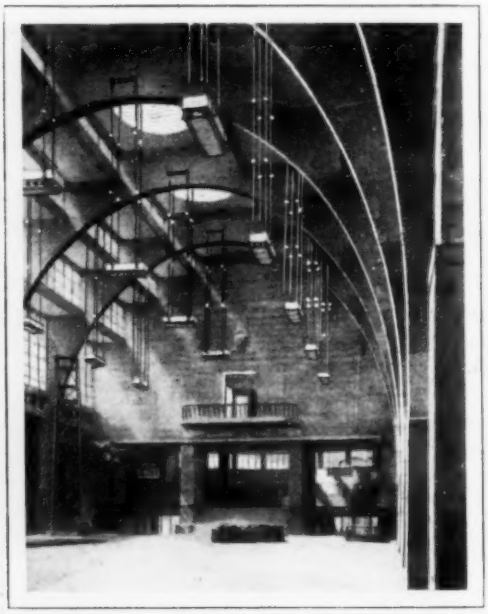
Folding Boat for Outboard Motor; the Craft Is Light in Weight and Fits on Side of an Auto

FOLDING BOAT FOR OUTBOARD IS EASILY CARRIED

For the motorist who would like to take a power boat along on a trip, but does not care to be bothered with a trailer or cradle, a collapsible craft with detachable outboard motor has been made. It is of mahogany plywood, and the seams are a double layer of impregnated canvas. The boat is in one piece and the sides fold down upon the bottom, making it flat for carrying purposes. The craft for two persons weighs only about 100 pounds and, folded, can be carried on the running board of the car, the outboard motor being stored on the luggage rack or wherever convenient. The seats open on hinges, help to hold the sides in place when the boat is folded, and brace them when in the water. The craft, with folded sides, can be employed as an aquaplane, and is also used as a service boat for seaplanes and as a tender for a larger boat.

¶Underground water in the earth equals nearly one-third the water in the oceans.



An Example of Panel Heating, Hot-Water Coils Being Concealed in Dome of This Structure

PIPES CONCEALED IN PLASTER HEAT BUILDING

Concealed heating is one of the unusual features of the recently completed British embassy in Washington. This system, in which hot-water coils are imbedded and completely hidden in the ceilings and walls, is known as panel heating, and has been employed in England for some time. Numerous advantages are claimed, including a large saving in fuel, since a room at a temperature of sixty-five degrees with the panel heat feels as comfortable as one ten degrees warmer with ordinary forms of heating, because the humidity of the air is higher. This system, aside from offering moist air, eliminates radiators or registers, and delivers only radiant heat in contrast with the ordinary radiator which delivers about two-thirds of its heat by convection as air flows upward in contact with the coils. In principle, it operates like a brilliant light streaming through a frosted glass ceiling, radiating beams into every part of the room. A plaster which will not crack is used.

SHARK FOUND IN FRESH WATER MAY AID WAR ON DISEASE

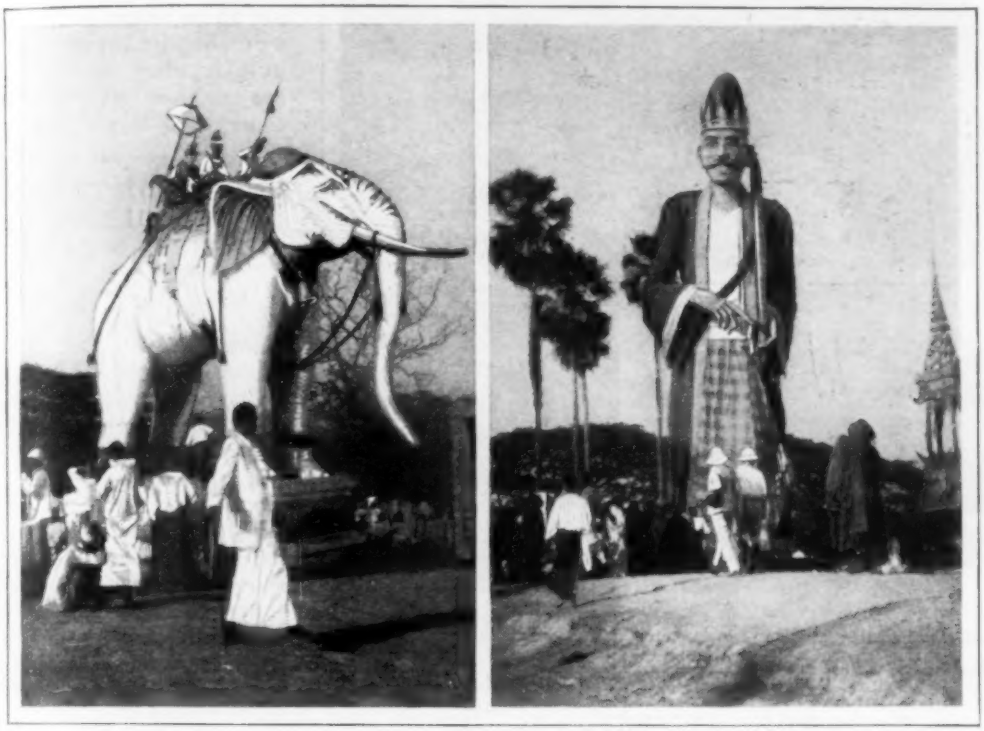
Man-eating sharks and sawfish found in the fresh waters of rivers near Singapore may aid man in fighting kidney diseases. Dr. Homer W. Smith, New York University physiologist, who discovered that these species of sea life ascend the tropical rivers, set up a laboratory in the Malaya to study them and found quantities of urea in the blood. This substance is formed by the combination of protein in the body and in other animals is excreted by the kidneys, failure to throw it off resulting in the disease known as uremia. Scientists are working on a theory that the presence of urea in these fishes is found necessary for them to live in salt water, and hope that a further study may throw light on obscure points regarding the function of the human kidney.

LIGHT UNDER INSPECTION BELT SHOWS FLAWS IN MICA

In searching for an economical method for examining mica used to make electrical apparatus, engineers devised a system that can also be applied to other forms of industry calling for careful scrutiny of material or finished articles. A moving translucent belt was made, the pieces of mica passing along the belt which in turn moved over strong lights. Dirt, metal fragments and imperfect pieces thus are quickly spotted by inspectors watching the belt with the lights shining through it.

Inspecting Mica Which Is Moving on a Translucent Belt with Electric Light beneath It

GIANT FIGURES ARE PART OF RELIGIOUS CEREMONY



Huge White Elephant and a Forty-Foot Man Used by Buddhist Burmans in Their Religious Rites; the Man's Figure Is Constructed over Two Palm Trees and Is Garbed in Real Cloth

Built of bamboo, paper and plaster of Paris, a forty-foot figure of a man and another of a huge white elephant are used by the Buddhist Burmans to pay tribute to well-known priests during religious ceremonies. These figures are so strong that the curious can climb to their tops and are employed as the temporary resting places for the dead. The white elephant is the mark of royalty. The man represents the figure of a historically famous priest, and during a ceremony is dressed in real cloth, which later is given to charity.

SWELLING OF CAST-IRON PARTS MAKES UP FOR ERROR

By repeated heating and cooling in a furnace, cast-iron can be increased in size as much as forty per cent without changing its metallic properties, although there is a reduction in strength of the swollen castings, but in cast iron this is not always important. Cast-iron bars, it has been found, must be heated to 1,200 degrees and cooled alternately 100 times to obtain an elongation of one inch per foot. These discoveries are being utilized commercially to correct errors made in machining. Expensive machine-worked pieces, when found to be too small, can often be expanded to a point where they can be worked down to the proper size. Tests also have disproved the old belief that cast iron becomes brittle under repeated shocks, for it actually becomes stronger by shocks. For this reason, it is better to tumble castings about in a barrel to remove foundry sand than to pickle them in acid.

¶A "sewing machine" for sheet steel and iron welds the parts electrically with a wire four times as fast as a skilled welder.

Electrically Operated Pocket Projector, Accommodating 250 Still Pictures, Which Is Ready to Operate When Plugged into Light Socket

POCKET PICTURE PROJECTOR IS AID TO SALESMEN

Intended particularly for classroom use and for salesmen, a compact projecting machine for showing still pictures is so small that it fits easily in the pocket like a small camera. It is less than seven inches long and weighs less than two pounds. Its operation is simple, as it is only necessary to place it on a desk, plug into a light socket, and turn a knob which throws bright, clear still pictures on the wall of a room. It accommodates 250 pictures and uses standard motion-picture film. A tiny fifty-watt lamp supplies the illumination.

GRAPE PULP REDUCED TO FUEL AND USEFUL CHEMICALS

Grape pulp, remaining after wine making, is being used in Italy to produce a number of by-products, including fuel and many chemicals. A factory at Modena is making from this hitherto waste product fuel bricks, alcohol, tartaric acid, cream of tartar, tannic acid and oil, using the dried pulp as fuel to create its own electric power. This plant has been able to net about forty-two cents per hundredweight of pulp handled, and there are millions of pounds that go to waste yearly.

WOOD CLOTHING AND JEWELS FOR SPORTS WEAR

Wooden accessories for clothes and jewels are being used in Paris, particularly for sports wear. Belts and bracelets are composed of bright metal and wooden disks, cubes, triangles and other geometric designs. Round wooden buttons, sliced in half and sandwiched with shiny nickel, are used for sports dresses, and similar buttons appear on accessories, such as choker or purse. Wooden buttons are used on sports coats with leather button-holes, and leather belts have cut-outs in which wooden pieces of similar design have been set.

ELECTRIC HEAT IN AUTO ENGINE HELPS EASY STARTING

Permanently fitted to the automobile engine, a small electric heater, operated by current from a lighting socket, keeps the motor warm, when exposed or in a cold garage, so that it can easily be started. It heats the fluid in the water jacket keeping it in circulation through the motor block, is economical to operate, can easily be installed and presents no fire hazard, as the heating element is immersed in water and there is a safety fuse to prevent overheating in case the water system of the car runs dry.

Uncle Sam Enters Atlantic Race

RIVETERS are thundering, steam hammers sputtering and air compressors coughing at the Camden works of the New York Shipbuilding corporation, where ships' plates are fitted together like parts of a Chinese puzzle.

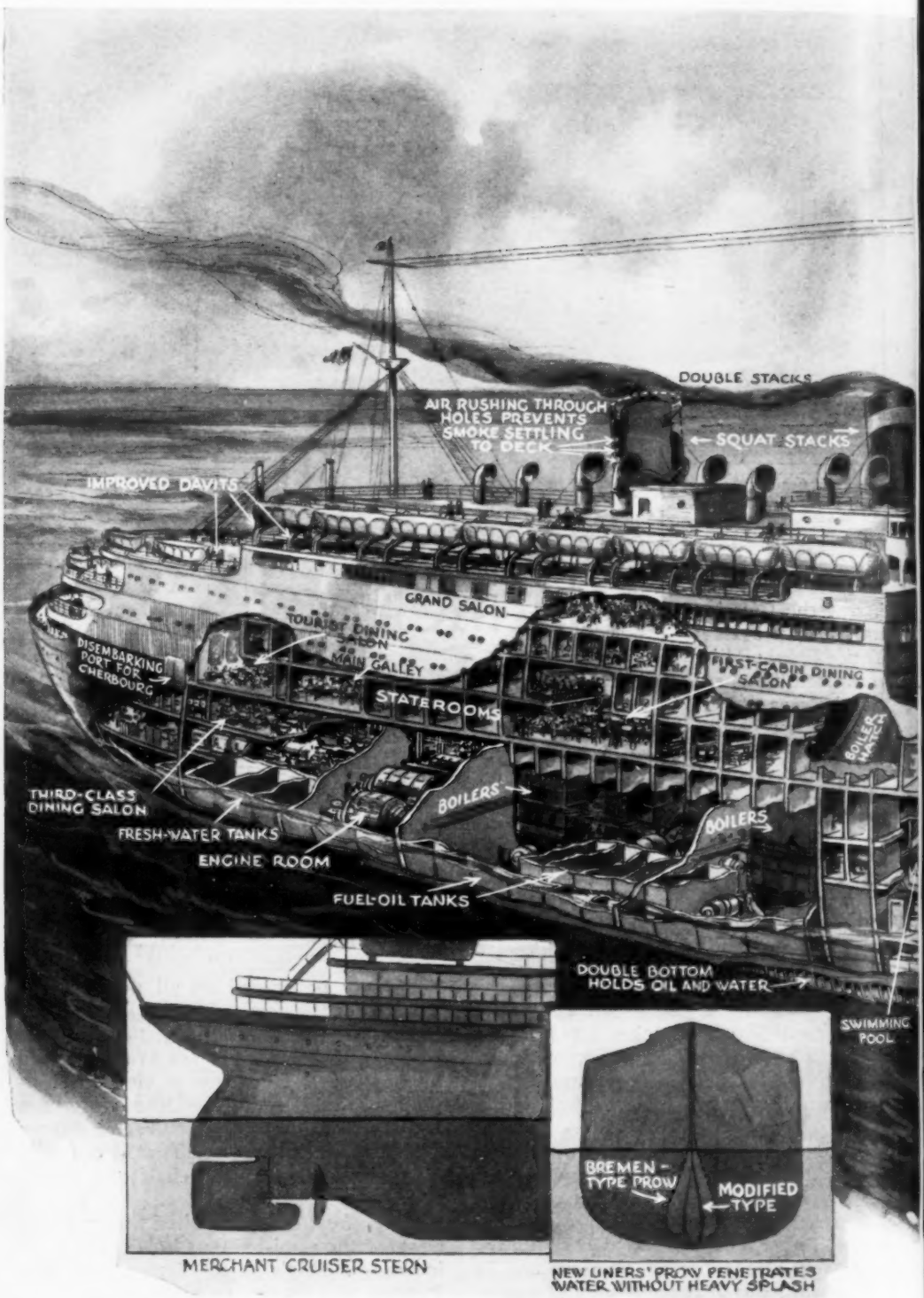
Derricks, tackle, hoists, overhead cranes and myriad men bend to the labor of building two 32,500-ton passenger ships, the finest examples of American marine architecture, and this country's first entries in the marathon for transatlantic supremacy.

With German ships possessed of the highest rating, with England about to lay the keels for 1,000-foot greyhounds, with France planning a 60,000-ton supership, the United States launches its five-year $90,000,000 program for a flotilla of superleviathans, ships whose speed and equipment will exemplify native engineering talent.

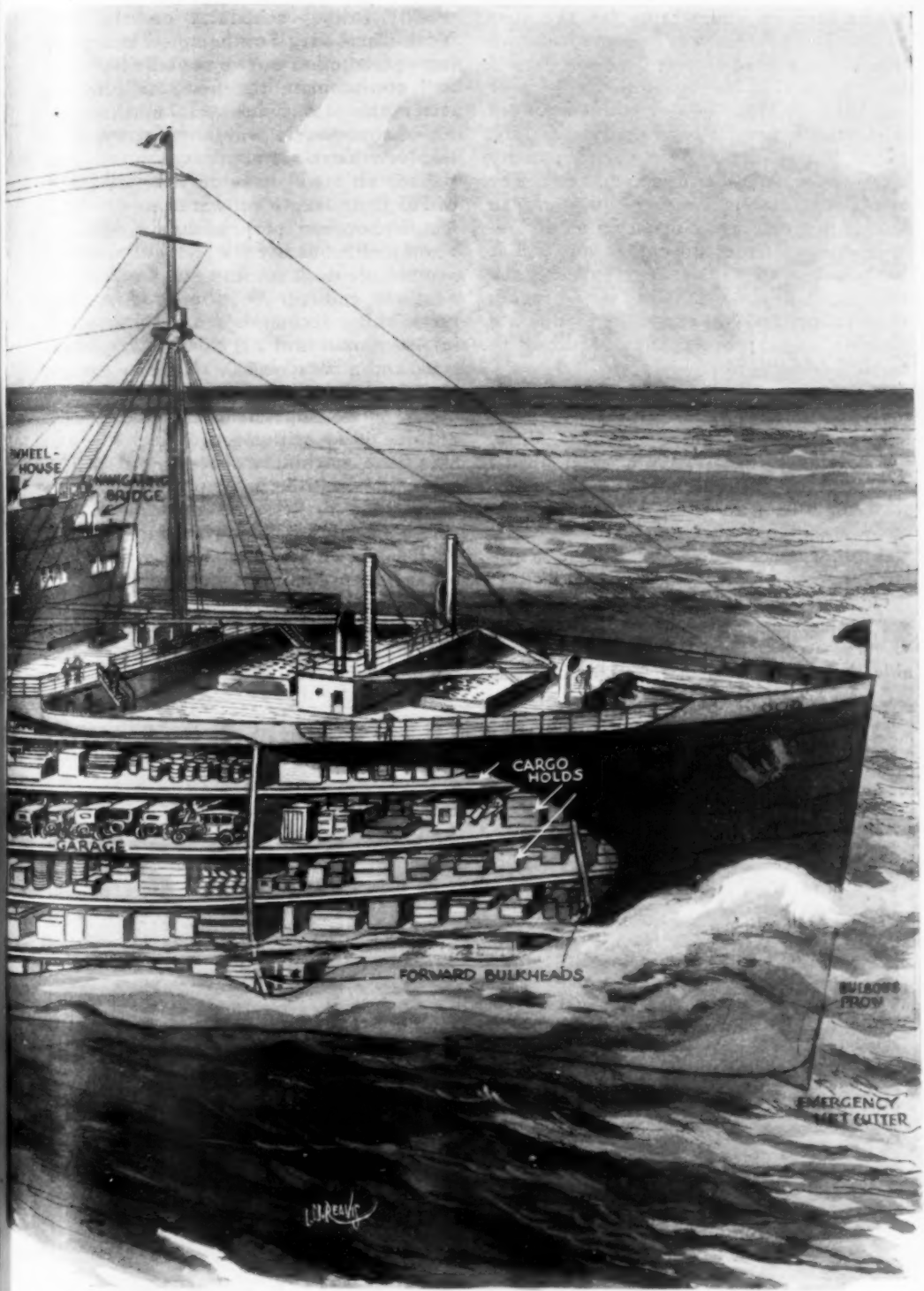
The two 32,500-ton ships now under construction are the largest and fastest passenger vessels ever built on this side of the Atlantic. They not only embody recent improvements on contemporary ships, but also introduce innovations in hull design, physical comfort and equipment. William Perrot, of the United States Lines, said that, after exhaustive tank tests in Washington, the company had adopted a semi-bulbous bow for the first two ships, costing about $21,000,000.

Contrary to the prevalent notion, he explained, the United States Lines is not committed to the full bulbous bow. Experience with the "Bremen" and "Europa" proves that this design impedes efficiency in rough weather. And since stormy crossings prevail on the North Atlantic ninety-two per cent of the time, the advantages of the full bulbous bow manifest themselves infrequently. Were the Atlantic ocean calm, the "Bremen's" bow would undoubtedly be copied on all new vessels. But no conclusive evidence proves that, under existing conditions, the bulbous bow can increase a vessel's average speed or efficiency. The current view in shipping circles is that the North German Lloyd will not repeat the "Bremen's" bow design on future ships. That decision is eloquent testimony on behalf of a modified bow.

Why, then, has the United States Lines adopted the semi-bulbous bow? Solely to increase a ship's safety factor, says Mr. Perrot; that means, to make possible the strongest kind of riveting in the stem bow,



Diagrammatic Drawing of One of the 32,500-Ton Ships Now under Construction at the Camden Works of the Exterior Features; the Ships Will Have an Over-All Length of



New York Shipbuilding Corporation; a Semi-Bulbous Bow and Improved Streamline Design Are Important
705 Feet and an Average Speed of Twenty-One Knots

where stresses and strains tax the steel work. Hence, the hulls on America's two new ships will be a cross between the old knife-edge and full bulbous bows. The feasibility of this design will be judged when the first twin is in operation, July, 1932. Extraordinary safety is the quality stressed by the American architects. The ship's metacentric height—equivalent to low center of gravity in an automobile—is such that, under no conditions, will it be possible to capsize her. Were she tossed free of the water, she would regain equilibrium and resume normal floating position. Such poise is rarely attained in marine construction.

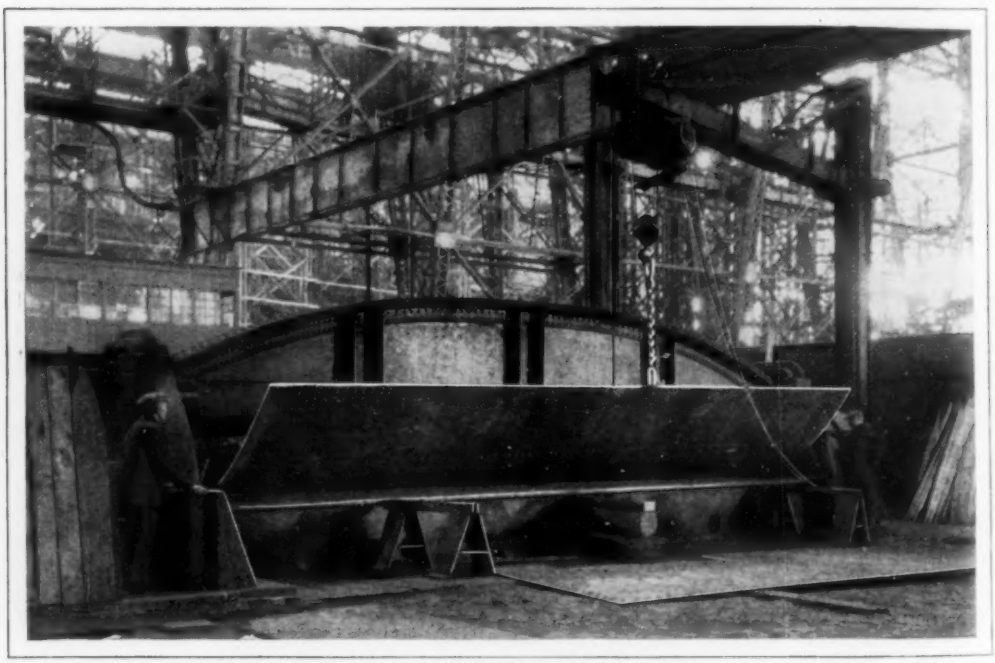
Installation of the first cooling system on a commercial passenger vessel will insure maximum comfort. On sultry days, when temperatures range around ninety degrees, refrigerated air will be forced through ducts, and the indoor heat reduced to seventy degrees. Likewise, every stateroom and public room will be ventilated, heated or cooled as desired.

Outboard designs of the two vessels, as yet unnamed, will correspond to the "Leviathan." These three ships will enable the company to maintain year-round weekly sailing schedules on the New York-Cherbourg-Southampton run, pending construction of two superliners which will consummate the five-year program. After the last twins are launched, the 32,500-ton vessels will be transferred to the New York-Hamburg run.

Each ship will have an over-all length of 705 feet; length on waterline 685 feet; length between perpendiculars 666 feet, beam molded eighty-six feet, and depth to promenade deck seventy-five feet. Specifications call for twin-screw first-cabin cargo ships, accommodating 600 first-cabin, 490 tourist and 200 third-class passengers, and a crew of 400. Raked stem and cruiser stern will enhance the streamline effect. The superstructure will consist of three decks, with a fourth deck fore and aft of the machinery spaces.

Interiors will be more palatial than the "Leviathan's." Several decks will have verandah cafes. The swimming pool will be finished in tile and marble. Modern barber shops, hairdressing and manicure parlors will be distributed about the ship. Children's playrooms, gymnasiums, and a complete printing plant are also specified.

The radio and telephone systems will



Bending a Big Steel Plate for One of the New Vessels Which Are to Enter the International Contest for Commercial Supremacy on the Atlantic

embody the latest improvements. Telephones will be available in each cabin. The Radiomarine corporation of America is building the wireless receivers and transmitters. One transmitter is to have 750-watt antenna capacity, and there will also be an auxiliary transmitter of the panel type and one short-wave transmitter for long-distance communication, by which the ship is enabled to maintain communication with both sides of the Atlantic.

These vessels will be the first built in this country with 400 pounds of steam pressure on the boilers and a 650-degree Fahrenheit superheat. The six drum-type boilers will have a total heating surface of 63,000 square feet. The boilers will be arranged for burning oil under forced draft with closed firerooms. The turbines will have a speed of approximately 1,800 revolutions per minute for the high-power and intermediate power, and 1,500 revolutions per minute for the low power. The propeller shafts will turn 125 revolutions per minute. The maximum ahead shaft-horsepower will be 30,000, equally divided between the two sets of turbines.

An average speed of about twenty-one knots will make these the fastest passenger ships ever constructed in this country.

PORTABLE FLOURMILL COMES TO FARMER ON TRUCK

Instead of the farmer going to the mill, as he has since the day when the process of turning grain into flour and feed by machinery was instituted, the grist-mill on wheels is now coming to the farmer. A portable flour mill mounted on a truck carries its own electric motor and is equipped to grind all kinds of feed. The mill goes to a farm, backs up to the granary and grinds the grain, saving the farmer hauling to and from the mill.

This Portable Flourmill Goes to the Farmer, Instead of the Farmer Going to Mill

Pressure Gun Being Used for Calking; Usually It Is Operated with Liquid Carbon Dioxide

CALKING WITH PRESSURE GUN SPEEDS UP WORK

Calking and other similar operations now may be done with a pressure gun having no compressors, generators or motors to get out of order. The machine consists of a steel vessel containing the rubberlike calking material in plastic form, a valve, air hose with fittings and delivery hose with nozzle, as well as a pressure-relief valve. Liquid carbon dioxide is the gas commonly used with the guns. The equipment can be used for rapid calking between masonry and wooden parts, for pointing up brick, stone and terra-cotta joints, for filling expansion joints in masonry and concrete, and for imbedding glass in skylights.

Beehive with a Glass Window in Bottom, Which Was Found to Increase the Yield of Honey

WINDOW IN BOTTOM OF HIVE INCREASES HONEY YIELD

By cutting a window in the bottom of the hives, a California beekeeper has devised a way to prevent the queen bees from leaving the colony and to increase the yield of honey. An opening, ten by fifteen inches in size, was made and a glass installed. The hive was raised a few inches above the ground and white paper spread under it to reflect the light into the brood combs. With this device, it was unnecessary to use a queen excluder, and the keeper found that hives equipped with the window yielded from 200 to 250 pounds of honey, while the others, not so equipped, had from thirty to fifty pounds.

RUNWAYS OF GLOWING STONE TO AID NIGHT FLYERS

Runways of glowing stone, visible to aviators at night without the need of floodlights, may be the answer to the landing-field illumination problem. An experiment with a stone of this kind is to be tried at the Akron municipal airport. A variety of rock that contains phosphorus has been taken from a quarry for use on the field. Aviators flying over the quarry at night, noticed the peculiar glow of the rocks. If the crushed stone maintains the shine it displays in the quarry, it is predicted that the material will have wide usage, especially at ports where adequate lighting systems are impossible because of too high expense.

DYNAMITE IS REPLACED BY AIR TO RAZE CONCRETE

By means of a hydraulic-pressure method developed in England, concrete walls, rocks and other materials are broken up without the use of dynamite, thus reducing noise, dust and danger. A hole is drilled into the mass as for blasting, and a hydraulic cartridge is inserted. By means of hand-pump pressure, dozens of small levers are released from the cartridge, pushing against the material on every side. Pressure of seven tons per square inch can be exerted. At first, nothing happens, then suddenly the mass cracks without endangering the workers or jarring the surrounding area. The system is especially adapted to wrecking jobs where the use of dynamite is impractical. The material can be broken into almost any size from chunks weighing several tons to pieces small enough for one man to lift.

Cracking Large Block of Concrete by Hydraulic Pressure, Thus Eliminating Danger of Explosives

With the ARCTIC Air Mail

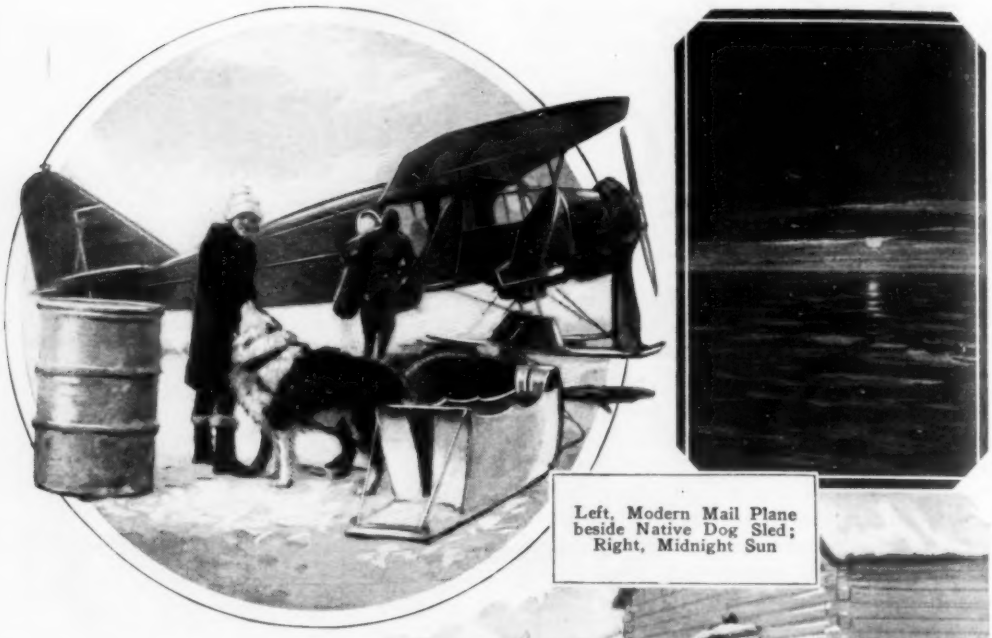
By JAMES MONTAGNES

THE WIND blows strong along the Mackenzie river. The temperature goes down with the coming of winter to stay at thirty or more below zero. Blizzards are common, lasting up to three days as a rule. Snow falls often and thick. The wind bites through everything. That is the Mackenzie river country where the farthest-north air-mail route in the world brings His Majesty's mail to the most northern Canadians.

From Fort McMurray, on the Athabasca river in northern Alberta, to the Arctic ocean, there are only two means of transportation in winter and summer. In winter the dog team has been the customary means of travel. In summer the water highway is used by all kinds of craft from canoe to steamboat, plying between McMurray and Herschel island, following the Athabasca river, Lake Athabasca, Slave river, Great Slave lake and the Mackenzie river to their destinations. And during both seasons the airplane is the only other method of travel.

The Arctic air mail is the longest and most dangerous run in Canada. Stretching for nearly 1,800 miles northward, it touches the outposts of civilization in the western Arctic where the mail used to come once a winter and not more than twice a summer. The airplane has made this difference: The farthest post on the line, Aklavik, at the mouth of the Mackenzie river, 200 miles above the Arctic circle, received eighteen mails during the first year of scheduled service, 1930, and some of the nearer posts as many as forty-one mails. Airplanes, operated by Commercial Airways, of Edmonton, have brought the far-away Arctic within mailing distance of the rest of the North American continent.

It is one thing to fly the mail along regular airways in civilized country near railways and telegraph lines, but quite another to take off at thirty below zero. There are sections along the route where flying 500 miles at 120 miles per hour constitutes a dusk-to-dusk flight. And this past summer the opposite held true. In summer, the sun shines for twenty-four hours in the Arctic. This service may seem unnecessary, but when it is learned



Left, Modern Mail Plane beside Native Dog Sled; Right, Midnight Sun

that upward of fourteen tons of mail have been carried during the first six months of operation, the need is brought out emphatically. The most distant points in Canada are today requiring all the latest means of transportation and communication because of their rapid development. The Arctic air mail is carried at no extra cost to sender or receiver. The regular first-class mail rates, applicable throughout Canada, are used on this route. Even newspapers and periodicals are carried at regular second-class rates, and only parcel post is expensive because the mail must guard against bulk on this northern route.

A Dog Team of Former Days with a Sled Loaded with Mail; the Scene Shows One of the Posts in the Mackenzie River Country

Weather forecasts are received with regularity by the pilots of this service at the various posts. The Canadian corps of signals operates for the Northwest Territories and Yukon branch of the Canadian department of the interior a chain of seven radio stations along this route. Pilots know in advance what type of weather to expect as they go ahead with the mail delivery winter and summer. The reports are awaiting them at every other fort along the way, and they notify their next destination by radio when they leave. There is no other method of fast communication in the country.

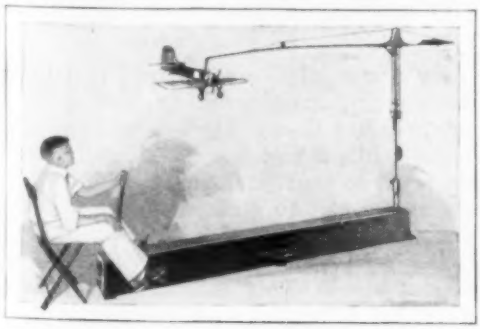
Those who live in the Arctic and sub-Arctic no longer look forward to a postman who travels by dog team. Today the Canadians of the Arctic know the arrival of the mail when through the silence of winter they hear the roar of powerful engines winging the scarlet planes with their heavy load of mail to a landing on a frozen river. The Arctic air mail has emancipated the Arctic.

PLANTS THAT POISON FISH AID MAN TO CONQUER DISEASE

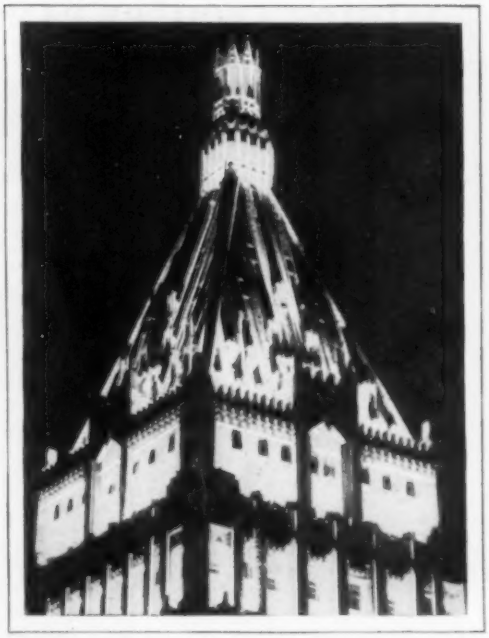
Plants poisonous to fish promise to become increasingly important to man in combating the tropical diseases caused by parasites. Some of the plants used by natives of tropical countries to daze or poison fish and make them easy to catch, also have been found potent to kill a species of fresh-water snail which harbors the parasite responsible for at least one dangerous tropical illness, known as bilharzia. There are many species of fish poison plants, and the use of some of them for insecticides has led to their cultivation.

STUDENTS ARE TAUGHT TO FLY SEATED ON GROUND

Student flyers of a St. Louis aviation school learn the first principles of flying by manipulating standard controls which govern the flight of a miniature airplane. The miniature ship, thirty-two inches wide and equipped with a small motor which rotates the propeller, is attached to an arm extending from a mast, the regulation controls operating through the mast and arm. The motor and propeller speed are governed by a throttle lever, and other controls operate elevators, ailerons and rudder. The plane flies in a circle about eighteen feet in diameter in either direction, and can rise to a height of about nine feet. By means of counterweights and a device for overcoming centrifugal pull, the ship in flight is virtually as free in its movements as though not connected to the mast, and thus can be caused to take off, land, rise, bank, make right or left turns, and execute other maneuvers.



Model Plane Attached to Mast and Operated by Student Flyer through Standard Controls



Not a Big Iced Cake, but a Night View of the Floodlighted Tower of a New York Bank

GIANT TOWER MADE BRILLIANT BY FLOODLIGHTS AT NIGHT

One of the unusual effects of carefully designed floodlighting is shown by a night view of the lofty tower of the Bank of Manhattan building in New York. This tower and the spire above it are thrown into brilliant relief against night's dark background as the powerful light projectors play on it, and a photograph of the illuminated portion at night might easily be mistaken for a close-up of a gigantic frosted cake.

CONSTANT HOT-WATER SUPPLY FROM SMALL KETTLE

Taking the place of an elaborate hot-water heating system for small apartments, a geyser kettle has been made to provide a constant warm-water supply at small cost. The kettle holds only a pint of water and is very shallow so that its contents, placed over a gas flame, boil almost instantaneously. As soon as the water boils, it is ejected from the spout. The tiny kettle is connected to a water supply so that cold water flows in as fast as the hot water is discharged.

ROADSIDE ARCHERY RANGES VIE WITH MIDGET GOLF

Above, Roadside Archery Range Where Many Shoot at One Time; Left, Instructor Coaching a Novice

Archery, one of the oldest of sports, is rapidly returning to favor, particularly as a sport for the modern girl since it is especially adapted to the development of arm and back muscles. California now has a number of large archery ranges where a dozen or more persons may shoot simultaneously, and one in Hollywood specializes in teaching girls how to handle bow and arrow. The ranges are vying with midget golf for public favor.

TREATED WOOD RESISTS HEAT LONGER THAN STEEL

By a special process, wood is said to have been made more flame-proof and fire-resistant than other fire-resisting material without the loss of characteristics that make wood desirable for interior and exterior uses. In a recent test, a wooden door, treated with the chemicals, withstood intense heat for a longer time than one of steel. This specially fireproofed wood has been used as a fire safeguard in the tower of the Chrysler building in New York city.

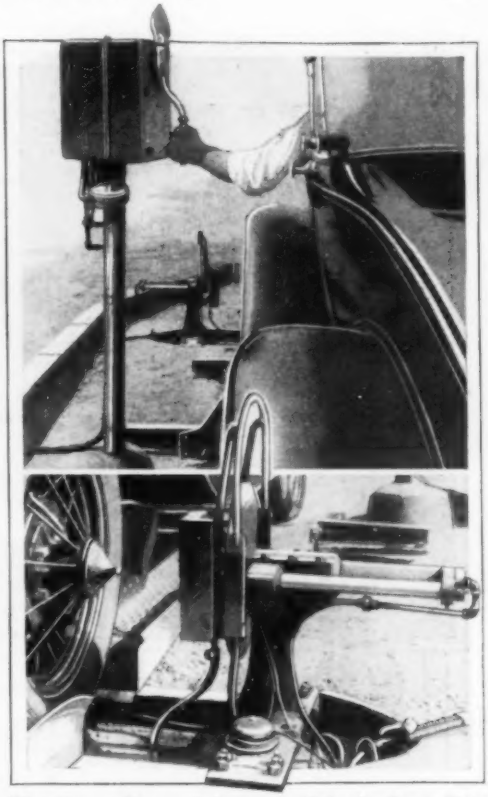
GUIDE MAPS ON OCEAN LINERS DIRECT PASSENGERS

Due to the necessity for economizing space in providing passenger accommodations on modern ocean liners, the interior often is more or less a maze to tourists. To keep passengers from becoming lost on such boats, the "Bremen" and "Europa" provide guide maps in the stairways connecting decks. These are arranged on top of tables and contain plans of all the decks and a list of all the public quarters and officers' cabins with a row of push buttons opposite them. To find his way from any guide map to a particular part of the ship, the passenger presses the button opposite the desired location, and the shortest route to it is lighted up on the deck plans.

LOUD SPEAKER REPLACES HORN FOR USE OF AUTOISTS

So that the driver can call to pedestrians who thoughtlessly get in the way, a microphone and voice-amplifier set has been introduced on an English car. The system is intended to supplement the usual warning horn, which sometimes confuses persons attempting to cross the streets. With the mike the autoist can also talk to the traffic policeman or ask for directions without getting out.

Microphone for the Motorist Enabling the Driver to Use His Voice to Supplement the Horn



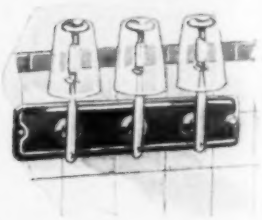
Tire Pump Operated from the Driver's Seat; Note Special Hub-Cap Coupling Extending to Valve

AUTOIST FILLS HIS OWN TIRES WITHOUT LEAVING SEAT

Controlled by the driver without leaving his seat, an automatic tire inflator is finding favor in California. The car is driven onto a runway and the wheel to be inflated drops into a depression which closes a switch to start the automatic mechanism. The driver registers the desired pressure on a control board by simply reaching through the car window. An inflating head then advances to establish a connection with a special coupling mounted in place of the hub cap on the wheel. A hose leads from this coupling to the tire valve. The inflating head withdraws from the hub-cap coupling when the desired pressure is reached.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.

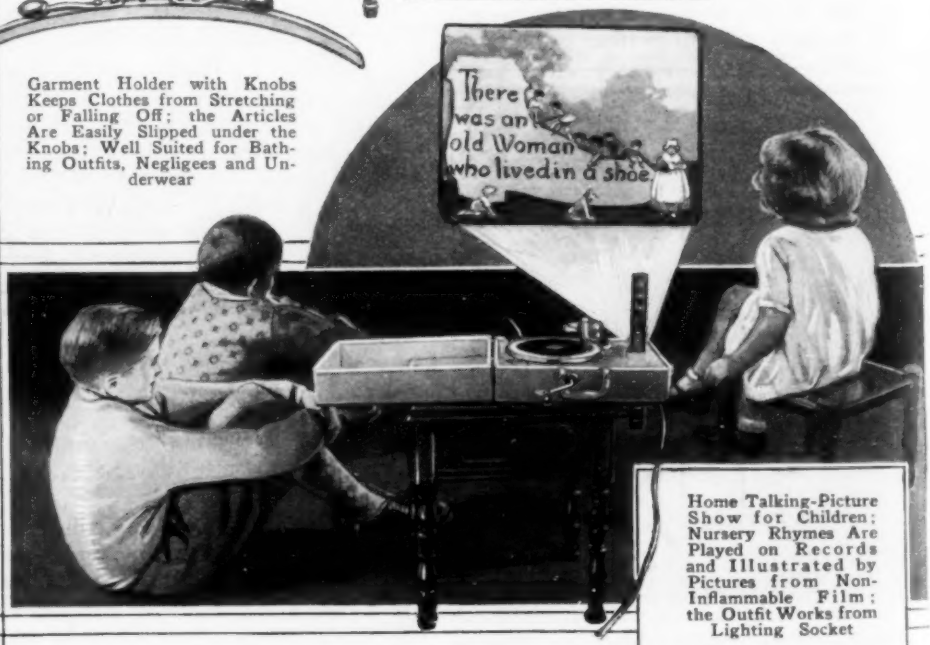
Easier Ways



Glass and Toothbrush Are Both Kept in Sanitary Condition on This Combination Holder

Just Press Button on Bridge Table, and Hinged Section Rises, Revealing Cards, Scorers, Pencil Tray and Ash Receiver

Garment Holder with Knobs Keeps Clothes from Stretching or Falling Off; the Articles Are Easily Slipped under the Knobs; Well Suited for Bathing Outfits, Negligees and Underwear



Home Talking-Picture Show for Children; Nursery Rhymes Are Played on Records and Illustrated by Pictures from Non-Inflammable Film; the Outfit Works from Lighting Socket

# of Doing It

Stainless Clothesline Is Easily Connected in Sections and Needs No Clothespins

Paper Plate on Tray Has Compartments for Different Foods, Saving Use of Dishes; Is Sanitary and Convenient for Parties and Sick Rooms

Needles Can Be Threaded in the Dark with This Holder That Has Metal Prong

Right, a Handy Chart Enables Quick and Accurate Recording of Bust, Waist and Sleeve Measurements of Garments; Photograph Shows How Set Is Used

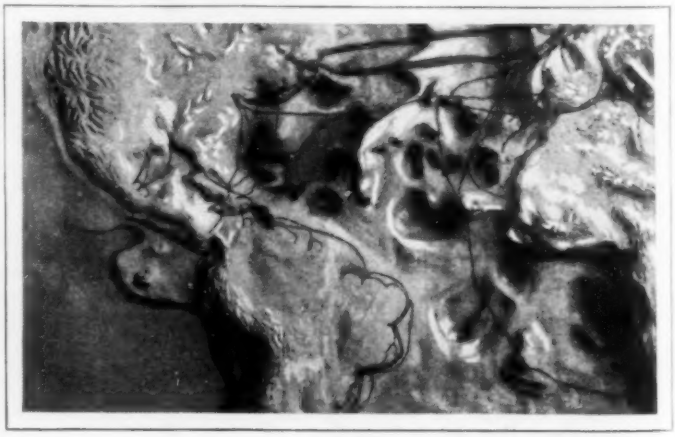
Cabinet Containing Radio, Movie Projector and Phonograph, the Latter Used in Presenting Talking Pictures

TALKIES, RADIO, HOME MOVIES AND PHONOGRAPH IN ONE

Combined in a single cabinet, virtually a whole theater for the home, radio, motion pictures, talkies and the phonograph are installed together, saving room space and increasing the possibilities of home entertainment. Sixteen-millimeter film is used, the same size as is in the usual home motion-picture camera. The phonograph unit is easily synchronized so that voice records for the film may be played satisfactorily. If desired, the pictures may be shown without the records or with musical accompaniment from the phonograph or radio. Radio and phonograph combinations have been available for some time, but several obstacles had to be overcome in devising a unit that would work with a projector as well. The difficulties have been solved completely, it is reported.

HOW BOTTOM OF OCEAN LOOKS IS SHOWN BY MAP

Thousands of soundings have made possible a fairly accurate contour map of the bottom of the Atlantic ocean. This work is invaluable in the laying of ocean cables. When the first submarine cable was placed, it was found that one broad section of the north Atlantic seemed to have been prepared by nature expressly for this purpose. This section is known as Telegraph plateau, and is about 400 miles in breadth, its soft, oozy bottom providing an ideal cushion for the network. Cables laid on the sea floor are subject to many perils. If suspended from point to point, they are likely to break under strain or to be chafed by the action of currents; if in too shallow water they are menaced by currents, icebergs, ships' anchors, whales, sawfish, swordfish, and even the tiny marine borers, if not coated with brass. New soundings are constantly being made, not only in the Atlantic but in all the oceans. The deepest ever recorded is 34,210 feet, near the Philippine islands. This depth of nearly six and one-half miles is almost a mile greater than the height of Mt. Everest, making the known variation in the level of the earth's crust twelve miles.

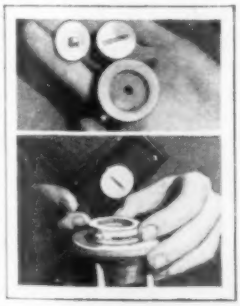


Map of Bottom of Atlantic Ocean Made After Thousands of Soundings Were Taken; the Black Lines Represent Telegraph Cables

MILLIONS IN MONEY HOARDED BY MISERS

Millions in the old and larger size currency which was replaced by the smaller bills more than a year ago still are outstanding, and much of it never will be presented for redemption, treasury officials believe. The aggregate gain to the government from this money which is never likely to come back has been estimated all the way from $10,000,000 to as much as $70,000,000. In addition to the currency destroyed or lost, the government believes at least $60,000,000 has been hoarded. More than $890,000,000 of the old bills still are outstanding, and one treasury official estimates that hoarding of paper money represents at least fifty cents per capita, or about $61,000,000, and aggregate hoarding of paper, silver and gold is estimated at $400,000,000. This money is hoarded by an estimated 8,000 misers in the country; in children's banks; by foreigners and others who do not trust banks; by those in isolated communities without banks, and by others who keep a certain amount of money always on hand. Fire and other catastrophes destroy large amounts of paper money annually.

CAMERA ATTACHED TO TRIPOD BY SELF-LOCKING DISKS



Screwing a camera to a tripod, then unscrewing it after making a picture, is a tedious process that is eliminated by a self-locking connector now being offered. The connector, with a shallow opening in the top, is screwed firmly on the tripod head and left there. Flat metal disks are then inserted into the camera mounting holes. When it is desired to fasten the camera to the tripod, one of the disks is placed in the connector socket and the rim of the connector is turned, firmly locking the camera in position. A slight turn in the opposite direction unlocks it, or it may be locked lightly at first, so that the camera can be turned.

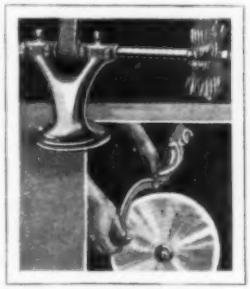
Champion White Leghorn and Some of Her Eggs; She Missed Laying Only Eight Days in a Year

WHITE LEGHORN HEN BREAKS EGG-LAYING RECORD

Three hundred and fifty-seven eggs in 365 days was the record of a champion white-leghorn hen on an experimental farm at Agassiz, Canada. The performance broke previous world's records, according to reports, and was attributed partly to the fact that, in addition to the usual scratch grain and mash rations, the hen was given plenty of skimmed milk and green feed. The eggs averaged more than twenty-six ounces to the dozen.

FLEXIBLE SANDER FINISHES IRREGULAR WORK

Reaching into the recesses on irregular-shaped work, such as hand and machine carvings, moldings, etc., a spindle sander now available reduces the time necessary for finishing operations. The sandpaper "disks" for use on the machine are cut so as to form a series of long fingers, which, while revolved at a speed sufficient to make them stand up to the work, are sufficiently flexible to follow projections and depressions of the surface closely.



Closing the Drop Section of Wing in Which Mail Is Carried in a Big Tri-Motored Ford Plane to Increase Its Capacity

PLANE CARRIES MAIL IN WING TO INCREASE LOAD

To take care of the increase of air mail, one of the large tri-motored flying post offices has been designed so that mail can be carried in its wing as well as in the regular compartments. A drop door, opened and closed from the underside of the wing, allows quick loading and unloading, and a considerable quantity of mail can be carried in the space afforded in the huge wing.

PART METALS PLAY IN DIET SHOWN BY TESTS

By feeding rats foods containing small quantities of aluminum, iron, copper and other metals, significant facts relating to the importance of these substances to the human diet have been learned at Johns Hopkins University. For instance, the tests prove that aluminum is not absorbed into the blood or tissues, and, hence, the fears of some housewives that use of aluminum utensils is dangerous, are without foundation. One group of rats was fed milk into which lettuce ash had been mixed. The milk alone produced an anemic condition and there was little improvement when the ash, containing iron, was added, but when copper salts were introduced with the iron into the milk, there was a marked change for the better. The rats gave evidence of much greater vigor and activity.

XYLOPHONE TOY PLAYS METAL RECORDS

One of the recent automatic toys is a small xylophone player. The mechanical musician strikes the proper keys through the action of a small metal record with uneven edges which serves as a cam to turn the figure to the right position so that its hands will strike the proper notes. The toy operates by winding and the records available include a number of selections, among them some of the favorite nursery rhymes.

Toy Xylophone and Player with Metal Record That Causes Different Keys to Be Struck

A Cold Wave Factory

By JOHN F. COGGSWELL

WHITE River, Ontario, is the official Canadian weather station that has come to be looked upon as the "cold-wave factory" of North America. Last winter the thermometer went to fifty degrees below zero. During January, 1930, the temperature got above the freezing point once.

Years ago, Medicine Hat, Alberta, was rated the low-temperature champion of the continent, chiefly by virtue of being the only weather station in a pretty cold district. The western Canada city never did cherish the title and, after many years' struggle succeeded in getting rid of what it considered a stigma.

There was a worthier champion, ready and willing to seize the title Medicine Hat cast aside so eagerly. White River inhabitants admit that their town is cold in the winter months. In fact, they're always ready with a mass of statistics, to defend their right to the frigidity championship. It is a division point on the Canadian Pacific railway, situated 741 miles west of Montreal, 251 miles east of Fort William and sixty miles north of Lake Superior. The town has a population of about 400, including Indians. White River is cold—no denying that. Consider the period starting on Feb. 11, 1930. All figures quoted are official. The temperature had been ranging along what the folks up there call just nice winter weather. February 10, the low reading was exactly zero and the high, eight above. By one minute after midnight—the first minute of the eleventh—the temperature had dropped to twenty-three below and stayed around that mark all day. At 8:00 o'clock in the evening, it was still down in the twenties below.

During the next four hours it soared up over forty degrees, to twenty-three above, and continued to rise all the next day, hitting thirty above at midnight. Twenty-four hours later, at 12:01 the morning of the fourteenth, it had taken a sheer drop of fifty-two degrees and registered twenty-two below. Gradually the temperature rose during the day and had worked back to zero at 2:00 o'clock the afternoon of the fifteenth. Then something happened. In a couple of hours, the

temperature tumbled twenty-nine degrees and kept going until it hit fifty below the next morning. Before noon it was back to the zero mark, and a few days later the district was in the midst of a most unusual February thaw, with a high mark of forty-two above.

In that spell of weather, the temperature showed a spread of eighty degrees, between high and low, in four days, and a spread of ninety-two degrees in six days. White River shows a range of over 160 degrees between the summer high and the winter low. In winter, changes of forty degrees in a few hours are common and in many full days the shift is seventy degrees and more. The record summer high temperature is ninety-three above and the lowest the thermometer has registered, during the forty years Judge Joseph Depew has been recording official weather statistician there, is sixty-eight below.

Usually the extremely low temperatures are unaccompanied by wind, and the frigid air is practically void of humidity.

Weather Tower at White River, Ontario, and Indian Squaw Leaving with a Load of Provisions for Her Husband, Who Is Tending a Trap Line in the Wilderness

The stranger—especially one from coast regions—always fails to realize the full extent of the cold. Three men stepped off a train one night in mid-winter to get a breath of fresh air before turning in.

"Thought this was the coldest place in the world," one remarked. "Seems just crisp and bracing to me. Guess it's a little below zero, though."

"Maybe a little more than that," a companion thought, "but it's not at all bad."

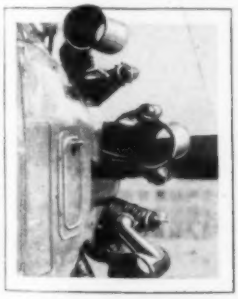
"Look out for your nose and ears, gentlemen," advised the Pullman conductor. "It's a mighty cold night."

"Cold nothing," one spoke up. "We've seen it colder back in Portland."

"Maybe you have, but I doubt it," replied the conductor. "It's forty-two below zero right now." A few minutes later, the trio knew the dry air had fooled them. When they got back into the car, they found that the toll of the frost was three frozen noses, six nipped ears and two had frost-bitten cheeks. They had been out less than ten minutes.

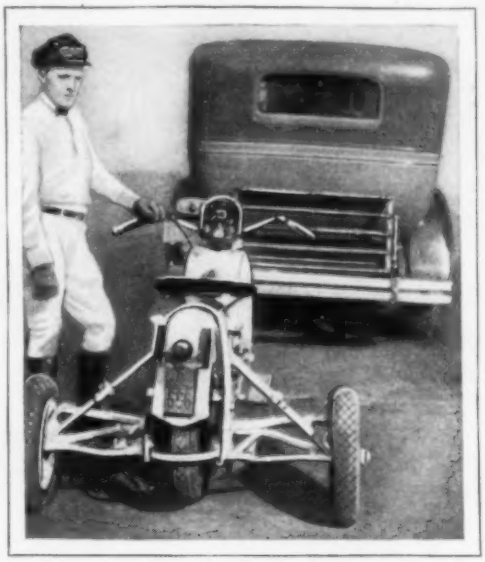
COOL AIRPLANE ENGINE VALVES WITH "FREEZING" TUBE

To keep airplane engine valves from becoming overheated, a western engineer has applied one of the principles of refrigeration in such a way that the valves are not only kept cool but the weight of the engine fittings is reduced. Venturi tubes are adjusted on each valve, permitting a strong flow of air to enter a narrow passage as the plane flies and to leave by a larger opening. As the air emerges, it expands, thereby cooling the valves.



MOTORCYCLE USED AS TRAILER HAS AUXILIARY WHEELS

Two auxiliary wheels for a standard motorcycle, when lowered to meet the ground, permit the vehicle to be towed behind an automobile, but fold up out of the way when not in use. The additional wheels, half the ordinary size, have no power of their own, but are employed to elevate the rear wheel of the motorcycle. Motorcycles so equipped are being used by garages in sending one man to call for or deliver a car, a task that formerly required the services of two men. The motorcycle, with its spare wheels folded, is used to reach the car, and then the outfit, as a trailer, is attached behind the auto and towed back to the garage.

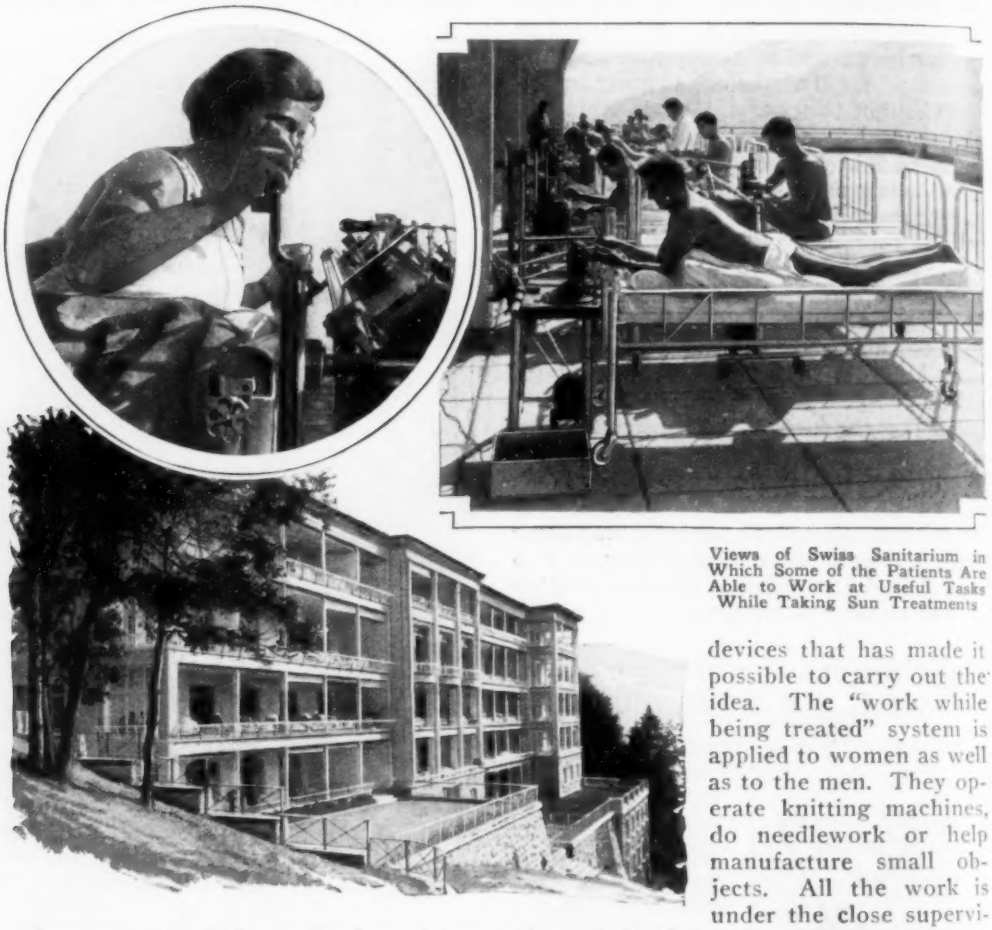


Motorcycle with Two Auxiliary Wheels, Which, When Lowered, Allow Towage behind Auto

MEDDLE-PROOF CASH REGISTER HAS COMBINATION LOCK

Cash registers now are being made with combination locks, affording the store or shop owner the same personal, private control over register records as though they were locked in a safe. More than 1,000 possible combinations are available with this type of lock, which, besides preventing manipulation of figures, does away with the annoyance from losing or forgetting keys.

CRAFTSMANSHIP TAUGHT IN SANITARIUM AIDS CURE



Views of Swiss Sanitarium in Which Some of the Patients Are Able to Work at Useful Tasks While Taking Sun Treatments

Inmates of a Swiss sanitarium defray part of their expenses and receive beneficial exercise by doing remunerative tasks even while they are confined to their beds. Electrical connections have been arranged so that small lathes and other machines can be operated, and as the patients receive their sun and other treatments for tuberculosis and other ailments, they turn out parts of watches or other instruments, perform small machine operations and other tasks, for which they are paid. The physicians in charge have found that the exercise stimulates circulation, helps strengthen muscles and is especially helpful in keeping the sufferers in a more cheerful frame of mind than they would be if they had nothing to do. A special bed, which can be turned into a workbench with little difficulty, is one of the devices that has made it possible to carry out the idea. The "work while being treated" system is applied to women as well as to the men. They operate knitting machines, do needlework or help manufacture small objects. All the work is under the close supervision of the doctors, and hours are carefully arranged in order to avoid undue fatigue.

NUT INSPECTOR RAISES QUALITY OF IMPORTATIONS

One of the odd government jobs in the winter is that of nut inspector. He operates under the food and drug administration and inspects foreign nuts imported into the United States. Last year, the eastern district of the administration examined about 600 importations amounting to over 21,000,000 pounds, including almonds, Brazil nuts, cashew nuts, filberts, peanuts, pistachios and walnuts. Inspection has resulted in improved quality of imported nuts and has increased public confidence in them as a food.

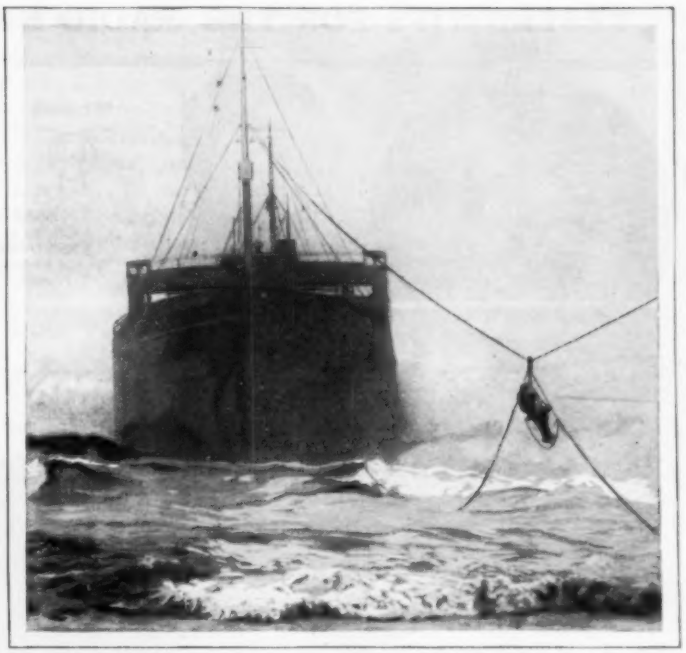
TOUGHER PAPER FOR NOTES IS SOUGHT

The small-size paper currency lasts longer than the former size, treasury officials have found, but a still better grade of paper is being sought, for the increased life of the new bills is not quite up to expectations. One-dollar notes of the large size lasted about nine months while the five-dollar denomination was good for a year or more. The average life of the new bills is only a few days longer. What is needed is a paper that will withstand much folding without breaking the grain, one that can be laundered, and yet will take the special inks required and be practical to manufacture. The new bills are not as easily counterfeited as the old, treasury officials are convinced, and the cost of circulating them has been reduced by one-third, largely because of the decrease in size and weight.

STENCIL SET FOR SHOWCARDS SAVES TIME AND MONEY

Attractive signs are easily made with the help of a stencil set that produces solid characters of a number of different styles. Little or no skill is required to operate the outfit which can be used as a money maker for spare-time work.

Stencil Set Especially Adapted for Making Showcards and Sample of the Solid Letters It Prints



Coast Guard Coming Ashore by Means of Breeches Buoy from Ship Grounded on a Rocky Reef off the Pacific Coast

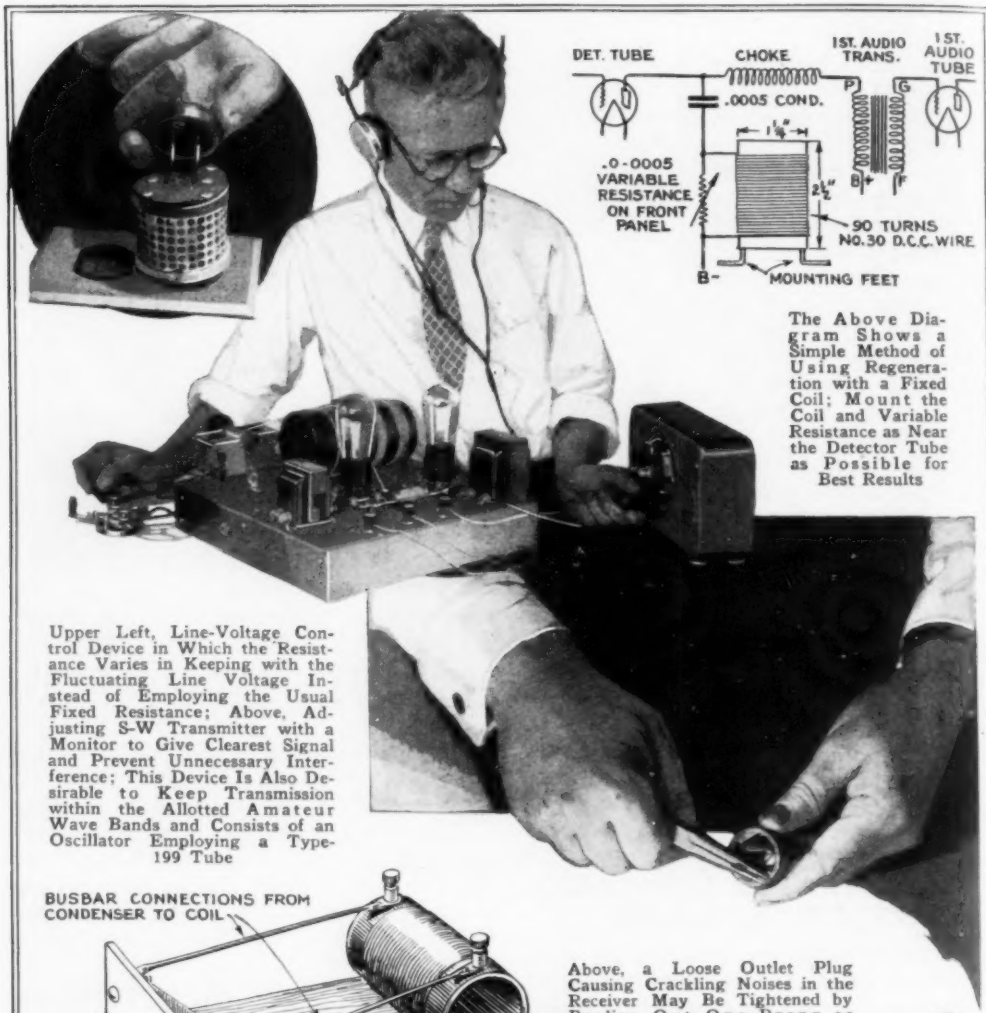
BREECHES BUOY SAVES CREW OF GROUNDED SHIP

When the tanker "Tamiahua" went on the rocks on a reef fifty miles south of San Francisco, the coast guard quickly established communication with the vessel by means of a breeches buoy. Over the cable connection from ship to shore a quartermaster with three broken ribs was carried to land for hospital treatment.

CONCRETE ROAD ON FLYWHEEL TESTS AUTO TIRES

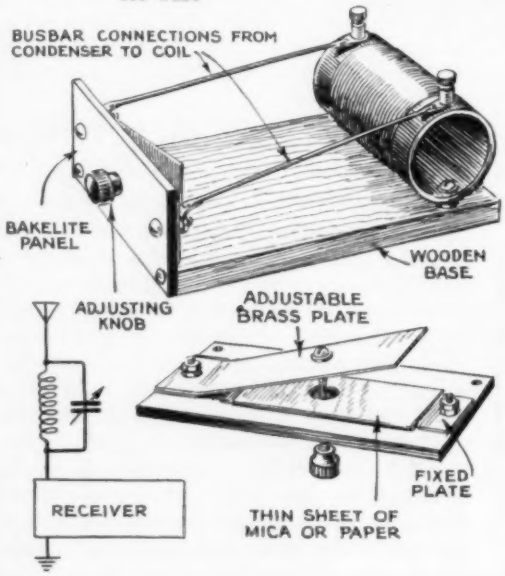
Automobile tires are tested under conditions approximating those met in actual service through the use of a machine on which tires are run for hundreds of miles over "roads" without leaving the laboratory. The rims of two cast-iron flywheels, eight feet in diameter, are filled with concrete. A chassis is placed in such a way that the tires rest on the concrete rims and the car is weighted to approximate a loaded auto. The driving force is applied through the rear end with the result that the tires, in revolving the concrete wheels on which they rest, encounter a resistance giving the effect of steady uphill climbing.

TESTED TIPS FOR THE RADIO EXPERIMENTER

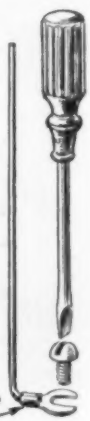


The Above Diagram Shows a Simple Method of Using Regeneration with a Fixed Coil; Mount the Coil and Variable Resistance as Near the Detector Tube as Possible for Best Results

Upper Left, Line-Voltage Control Device in Which the Resistance Varies in Keeping with the Fluctuating Line Voltage Instead of Employing the Usual Fixed Resistance; Above, Adjusting S-W Transmitter with a Monitor to Give Clearest Signal and Prevent Unnecessary Interference; This Device Is Also Desirable to Keep Transmission within the Allotted Amateur Wave Bands and Consists of an Oscillator Employing a Type-199 Tube



Above, a Loose Outlet Plug Causing Crackling Noises in the Receiver May Be Tightened by Bending Out One Prong as Shown; Left, an Inexpensive Wavetrap or Sensitivity Control; the Coil Consists of 180 Turns of No. 30 Enamel Wire Wound on a Fiber Tube, 1½ In. in Diameter and 3½ In. Long; the Adjusting Screw for Moving the Condenser Plate Is Threaded through the Bakelite Panel, and the Plates Approach Each Other but Never Touch, Owing to the Mica Sheet; the Brass Plates Are ⅞ In. Wide and 2½ In. Long; the Device Is Connected in Series with the Antenna Lead to the Set as Shown; Right, Spade Lug Soldered to a Length of Busbar Wire Holds Machine Screw in Locations That Are Difficult to Reach



Shorter Antennas for Screen-Grid Tubes

The screen-grid tube is largely responsible for the change in antenna requirements. Many modern receivers employing these tubes are capable of receiving local programs without an antenna, or with a few feet of wire at most. These receivers, operating from a light-socket antenna plug of good design, generally have a good wide reception range.

Effect of One Bad Radio Tube

There is an erroneous impression that one or more worn-out radio tubes will have a very serious detrimental effect on transformers. This is not true, tube engineers say. They point out, however, that one or two worn-out tubes will mar the performance of the receiver, and in battery-operated sets, will adversely affect the good tubes. In these receivers, volume control is obtained largely by means of the filament rheostat. When sufficient volume is not obtained, owing to one or more poor tubes, the filament rheostat is turned up higher. This procedure increases the voltage on the good tubes and shortens their period of life. In a.c. operated sets, a somewhat different condition exists. The voltage applied to the tubes is taken care of in the design of the receiver, and the volume is controlled independently of the filament circuit. In such receivers a poor tube affects the performance, but usually does not influence the other tubes detrimentally.

Rheostat Controls Television Motor

The power rheostat shown in the photo is of the graphite compression type and is designed for providing a "stepless" control for scanning-disk motors, transmitting-tube filaments and other apparatus requiring a variable heavy-duty resistance. It is rated at 75 watts for continuous operation, and the resistance range is from 4 to 150 ohms.

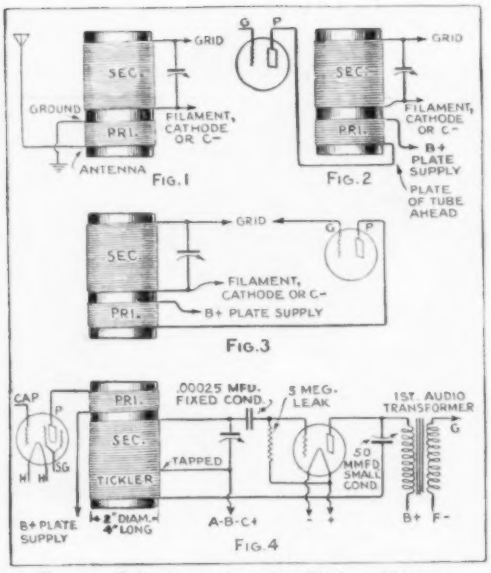
View of Completed Televisor from the Front, but without the Magnifying Lens

Home Televisor in Kit Form

For those desiring to build a radiovisor or television device, a kit now available contains all the necessary parts of the scanning unit ready for assembling and wiring, except the wood pieces for the base and the bakelite panel for the platform on which the unit is mounted. The completed televisor includes a Faraday induction motor which drives the scanning disk at synchronous speed, a motor-control rheostat, and a housing for the neon bulb. The scanning disk is obtainable in the 48, 60, 24 and 45-hole types, with corresponding rotors for the desired number of pictures per second. When employed on an a.c. power system in common with the television transmitter, practically automatic synchronization is obtained. When employed on a separate a.c. power system, this result may be achieved by manual adjustment in a relatively simple manner.

Increasing Tungar-Charger Rates

The rate of tungar, or any of the 2-amp. tube chargers, can be increased to slightly over three amperes by removing the outer shield around the transformer. This shield absorbs considerable energy, and to give your A-battery a much quicker charge, simply remove this cover and note the increase in the charging rate.—D. A. Brown, Marion, Ohio.



Correct Coil Connections for Various Purposes

Correct Connections for Homemade Coils

Winding your own coils is a simple matter, but many experimenters are puzzled when the time comes for connecting them in the circuit, and very few diagrams show this detail clearly. Fig. 1 shows the connections for the usual type of antenna coil. In Fig. 2, giving the correct connections for an r.f. transformer, it should be noted that the plate and grid connections are always on the opposite ends of the coil. When the r.f. transformer is to be used as an oscillator, the connections are made as shown in Fig. 3. To connect a coil using regeneration with a fixed tickler, follow the hookup given in Fig. 4. To make coils of this type for a .00035-mfd. condenser, use No. 28 d.c.c. wire, the primary consisting of 40 turns and the secondary of 118 turns. Tap the secondary at the 78th turn, thus making a fixed tickler coil of 40 turns. For a .0005-mfd. condenser the primary should be 40 turns and the secondary 100 turns, tapped at the 60th turn to provide a tickler coil of 40 turns. In this coil, as well as in the other coils, all windings run the same way.—Henry Laraby, New Haven, Conn.

For further information on any radio construction article write to the radio department; this service is free.

Dynamotor Operates from Battery

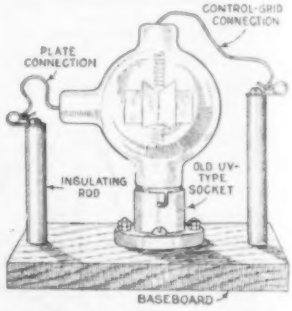
Radio owners living in rural districts where farm-lighting plants are employed have a handy means of charging A-batteries but usually depend on B-batteries for their plate supply. This group may be interested in the new dynamotors. These machines operate from a 12-volt storage battery and deliver 220 volts of direct current suitable for the operation of many standard receivers. All objectionable commutator ripple and noise are eliminated by a filter. The entire unit occupies a space less than six inches square, and the weight is correspondingly low. It is of particular value where light and power are not available.

Charging the Battery While in Use

Many users of battery-type radios have discovered that they may charge the storage A-battery while the radio is in use, the only difference being a hum from the loud speaker. This practice is permissible only in cases of emergency, however. The reason for this is that if one of the battery clips develops a loose or high-resistance connection, the charger is left directly connected to the tubes and subjects them to its maximum voltage, which is too high for the tubes.

Mounting 860-Tubes

An old UV-type socket provides the necessary support for the rather large 860-tube now commonly used in many amateur radiophone sets. The socket is mounted on the baseboard in the usual manner. Fahnestock-clip connections are mounted on fiber or bakelite rods, as shown, at suitable heights for control-grid and plate leads. The filament connections are made in the socket. The grid terminal on the socket serves for the usual screen-grid connection, but the plate terminal is not used.



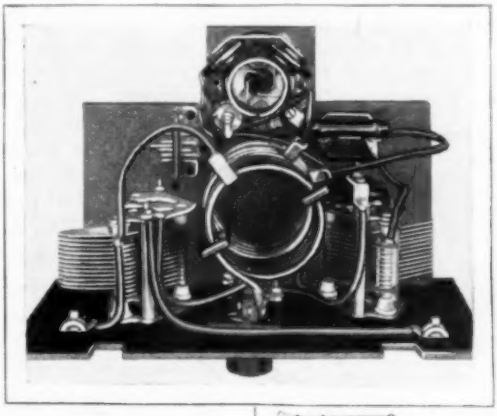
BUILDING PORTABLE S-W TRANSMITTER

by GILSON V. WILLETS

PART I

Mr. Willets, W6EEZ, at the Key of the Portable S-W Transmitter Described in This Article

BEING a traveling salesman, and also an amateur wireless operator, W6EEZ, I have taught my wife the code and sufficient practical knowledge to operate a short-wave station in my home at Long Beach. Each night when I am on the road up and down the Pacific coast, I connect up a portable radio transmitter and communicate with my wife. We maintain a regular schedule and may be heard almost any evening around 7:00 p.m. (Pacific standard time) discussing family affairs.



We have started a new fad among amateur radio operators, resulting in a growing demand for efficient portable transmitters. Traveling men are usually some place where an a.c. source of supply is available; therefore, a compact portable transmitter operating from an ordinary electric-light socket is desirable. The portable set to be described is the original referred to above; the compact design is original and the assembly embodies several unique features.

All parts are standard and easily available at a very reasonable cost. The outstanding feature of this midget transmitter is the method of dividing the power and oscillatory circuits in two separate units, either of which may be quickly removed for repairs. These units are mounted on bases of soft white-pine board, and may be instantly connected or disconnected by means of a standard 7-wire cable, plug and receptacle. The details of both units and the method of connecting are clearly shown in the photos and diagrams.

The complete transmitter is housed in a Philco

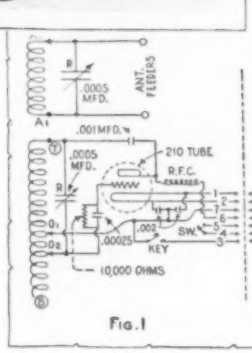


FIG. 1

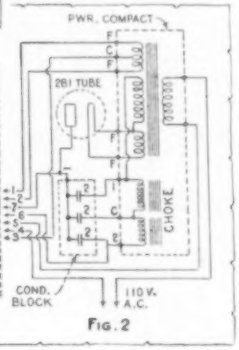


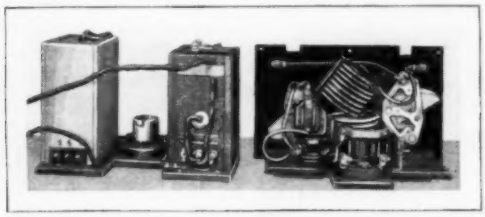
FIG. 2

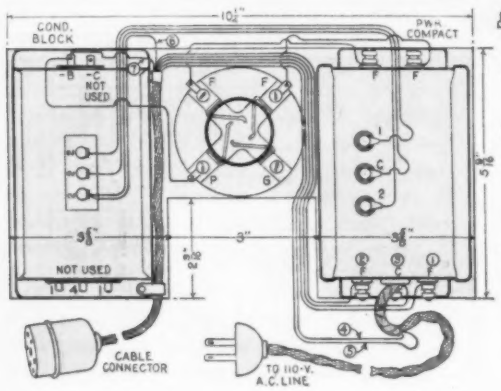
battery-eliminator box, or the box may be built from instructions which will appear in Part II in the March issue of this magazine. The entire oscillator unit is so constructed that, by removing the screws which hold the front panel in place, it may be taken out of the set after the plug has been disconnected.

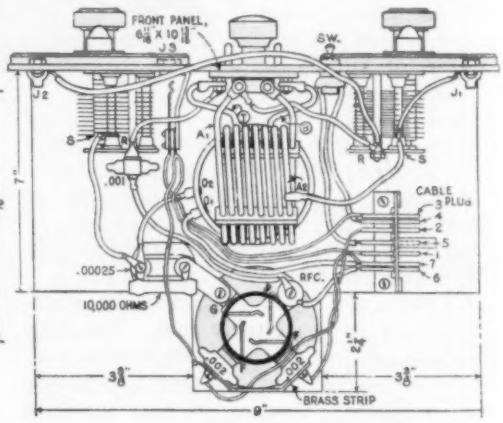
The baseboard on which the power unit is mounted may be screwed down to the bottom of the box. This unit consists of a power compact delivering current for the filaments of the half-wave rectifier tube and the type-210 tube in the oscillator unit. Figs. 1 and 2 show each individual lead between the two units numbered to correspond with the color key on the cable plug, which is shown in Fig. 4. The power compact is equipped with a flexible cord and plug. This may be connected to any 110-volt a.c. outlet and, when not in use, is coiled up inside the transmitter case.

Although only half-wave rectification is used in this portable job, the filter condenser smooths out the transmitted signal to a satisfactory purr. If full-wave rectification were used, much more weight and equipment would be required. However, when the set is used in the home station, full-wave rectification may be obtained by the use of an external source of current supply. Furthermore, when traveling far from any source of a.c. supply, another female plug, to be described in Part II, may be used with batteries with the resulting pure d.c. note. A third female plug for using an external full-wave source will also be described in detail.

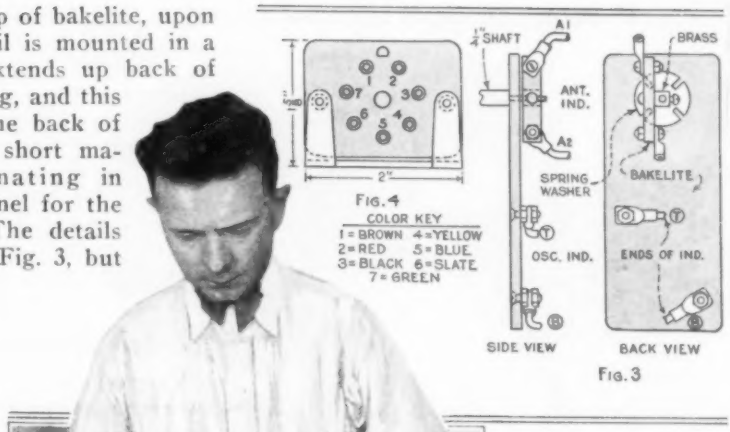
The oscillator unit employs a standard Hartley circuit, assembled in the most compact manner possible. The coils are homemade, the primary coil, the terminals of which are indicated as T and B within circles (the letters also standing for top and bottom of the coil), is wound with $\frac{3}{16}$-in. copper tubing, or No. 6 Band-S copper wire on a form, $2\frac{1}{2}$ in. in diameter. Seven turns are required for this primary coil. When the winding is completed, space the turns about $\frac{1}{8}$ in. apart with a blunt instrument and remove the form. The secondary coil, the terminals of which are indicated as A_1 and A_2, is wound with the same-size wire or tubing, and eight turns are required. This coil is the same diameter as the primary, and the turns are spaced in the same manner. A .0005-mfd. condenser is used to tune the secondary coil, and flexible leads run to midget jacks J_1 and J_2, mounted on the front panel for the antenna feeders, as shown in the diagrams. The flexible lead indicated as A_2 terminates in a clip that provides for the necessary inductance adjustment. This secondary coil is variable and is connected with a shaft that runs through the front panel to a knob and pointer used for varying the coupling. The method of mounting this variable coil is shown in Fig. 3. A small piece of bakelite supplies the mounting for the coil, and this is mounted on the shaft so as to







turn with it. The strip of bakelite, upon which the primary coil is mounted in a stationary position, extends up back of the rotor-coil mounting, and this assembly is held to the back of the front panel with short machine screws, terminating in stops on the front panel for the knob and pointer. The details are clearly shown in Fig. 3, but need not be followed if the builder can hit on some simpler plan.



The oscillator inductance or primary is the lower coil, shown in the simplified wiring diagram, and the lower terminal of this coil, indicated as B, is the dead end. The top terminal T is also connected by a flexible lead to the rotor of the variable condenser. The other flexible leads terminate in clips O_1 and O_2 on this coil. Clip O_1 will go to the turn next to the top on this coil and the position of O_2 will vary somewhat near the center of the coil. These adjustments are found when tuning.

The two .002-mfd. by-pass condensers are mounted vertically with brackets directly on the filament terminals of the large UX-type socket for the type-210 tube, and are connected at the top with a narrow strip of brass, the center tap between the two being taken from the top condenser lug at the left. The grid-condenser and gridleak assembly is mounted horizontally near one side of the socket and is connected to the grid terminal of the socket with a thin strip of brass. The .001-mfd. plate-blocking condenser is mounted on the back of the .0005-mfd. oscillator-tuning condenser on the rotor side.

The r.f. choke coil is homemade and consists of about 200 turns of No. 30 s.c.c. wire wound on a small wooden bobbin, which is mounted on, and connected to, the plate terminal of the tube socket.

The 110-volt supply is controlled by a snap switch which is mounted on the front panel, and two vernier dials take care of the necessary tuning.

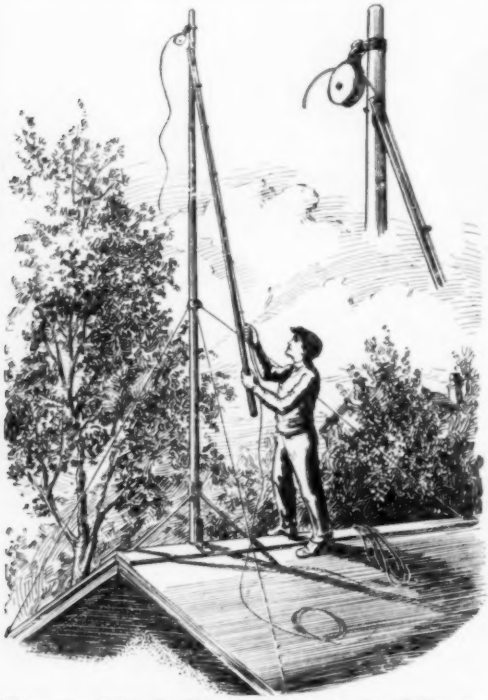
One difficulty encountered after constructing the oscillator unit was a vibrating of the secondary coil. To overcome this, strips of bakelite were mounted on either side of the secondary coil and firmly strapped in place. This eliminated the trouble and gave a steady signal. The strips will be noted in the simplified diagram on page 300.

The construction of the power unit is very simple; the power compact is an R210-type, and the filter block is the standard type designed for it and known as the R210-type also. This unit was chosen because it is very compact and delivers about 600 volts for the plate supply and 7½ volts a.c. at 1¼ amp. for the rectifier filament, as well as 7½ volts for the oscillator filament. It also contains 2 chokes rated at 30 henries each. The entire compact is indicated within the dotted lines in Fig. 2, and the condenser block is also in dotted lines in the same diagram, the negative-B terminal being common to each of the three 2-mfd. capacities.

(To Be Continued)

¶If the volume control makes a crackling noise when adjusted, it may be quieted by rubbing a soft lead pencil over the wire and turning the knob in order to distribute the lead evenly.

Wired Pole Aids Stringing of Antenna



How the Wire Is Threaded through the Pulley to Raise the Fallen Antenna

When the rope or wire threaded through a pulley for supporting the antenna breaks, and the mast is of the usual type shown in the sketch, the owner can save himself time and labor with a simple device. Instead of dismantling the mast to get the rope back through the pulley, a light pole is provided with screweyes, spaced as shown in the sketch, and used as a guide. A fairly stiff wire is threaded through the eyes and fed through the pulley, then fastened to the rope which is pulled through and the job is completed. —E. Moffat, Van Nuys, Calif.

Testing the Selectivity of a Set

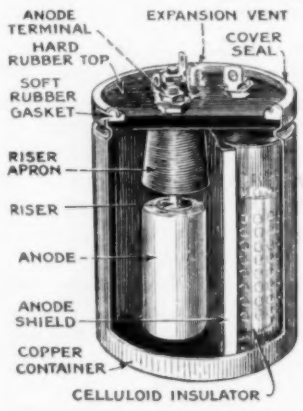
Anyone can quickly test the selectivity of a receiver by tuning in the nearest high-power local broadcasting station and observing the effect of slight detuning upon volume. For example, tune a single-control receiver to the greatest volume with the dial set exactly at the station's transmitting frequency in kilocycles (say 950) then turn the control knob right and left so that the scale reads 10 kilocycles above and below that figure. If this is sufficient to tune out the local station, or to reduce its volume substantially, it indicates that the receiver is highly selective. A receiver of fair selectivity will tune out powerful stations 20 kilocycles above and below the station frequency, while a receiver which requires tuning 30 kilocycles above and below to tune out the local, would be lacking in selectivity and useless in the immediate vicinity of such stations.

Spreaders for Zeppelin Antenna

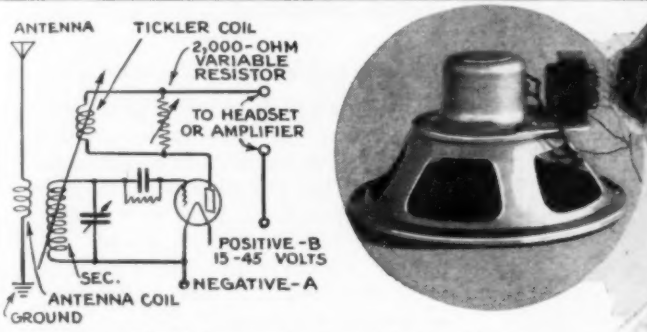
Very efficient spreaders for a Zeppelin-type transmitting antenna, can be made from glass towel rods. The small rods, about 10 in. long, that may be obtained from the 5 and 10-cent stores serve the purpose. One end of these rods is already flattened slightly; the other end may be heated with a blowtorch or over a Bunsen burner and flattened in the same manner. The rods are fastened to the feeder wires with short pieces of wire or inserted between the strands, if the usual stranded antenna wire is used and then held in position with a loop of wire twisted around the feeder above and below the rod.

This Condenser Repairs Itself

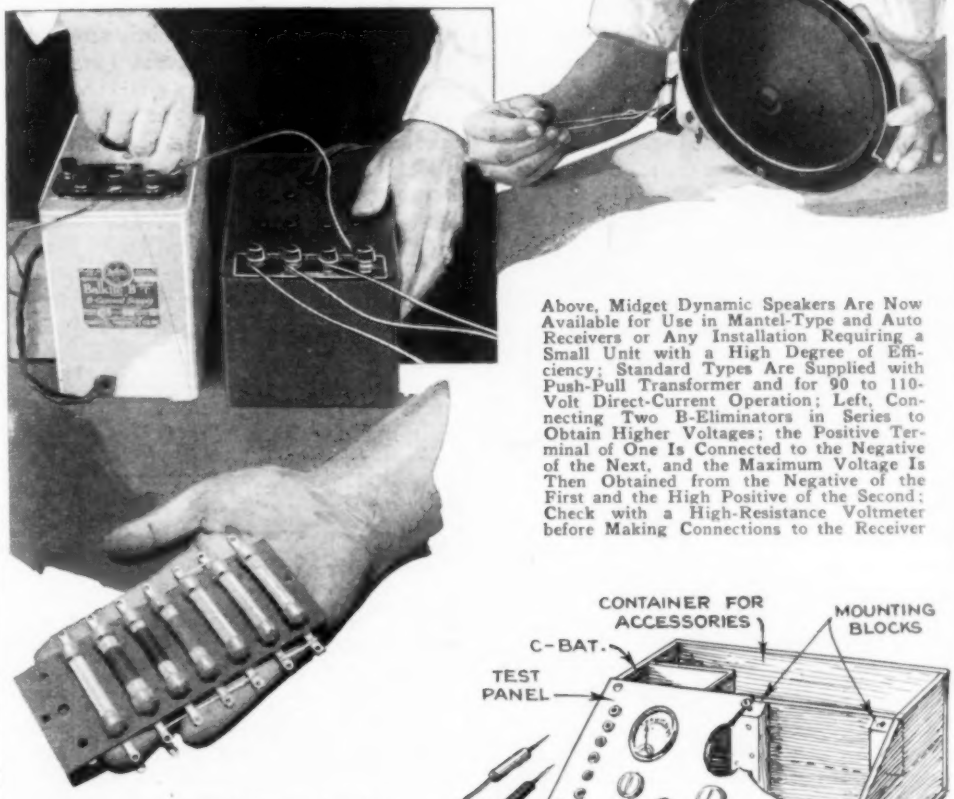
The sketch shows a sectional view of an electrolytic condenser now available for use in filter circuits which is immune to damage from high-voltage surges. Because of its large capacity, this type of filter condenser improves the filtering of the power pack, which results in a considerable reduction of hum. Single units have positive terminals at the top or bottom as desired, with capacities of 8 or 18 mfd. Multiple units have positive terminals at the top and may be obtained in either double or triple-unit styles.



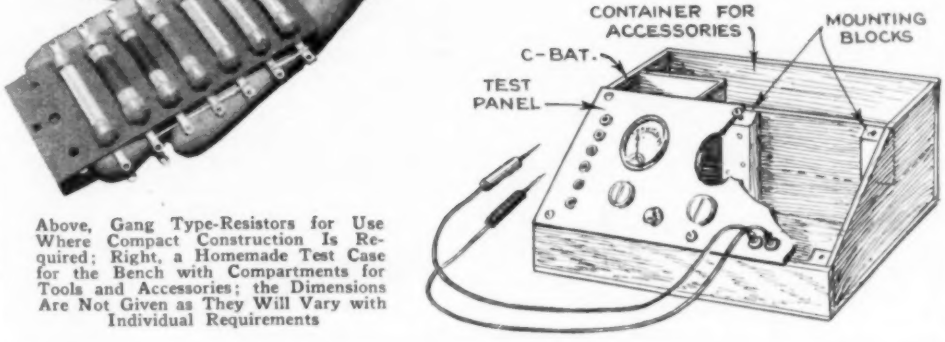
HELPFUL HINTS AND KINKS FROM THE RADIO LAB.



Above, a Simple Regeneration Control for Short-Wave Receivers That Consists of a Non-Inductive 2,000-Ohm Variable Resistance Connected Directly across the Tickler Coil as Shown; a Graphite or Carbon Resistance Unit Is Best for This Purpose and Provides a Smooth and Non-Critical Adjustment; This Does Away with the Usual Variable Tickler, Which Does Not Maintain Its Adjustment

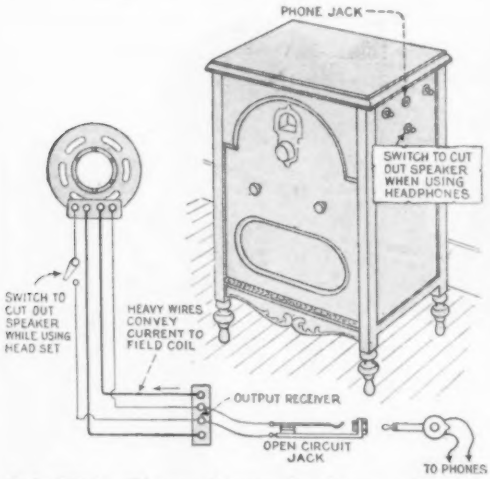


Above, Midget Dynamic Speakers Are Now Available for Use in Mantel-Type and Auto Receivers or Any Installation Requiring a Small Unit with a High Degree of Efficiency; Standard Types Are Supplied with Push-Pull Transformer and for 90 to 110-Volt Direct-Current Operation; Left, Connecting Two B-Eliminators in Series to Obtain Higher Voltages; the Positive Terminal of One Is Connected to the Negative of the Next, and the Maximum Voltage Is Then Obtained from the Negative of the First and the High Positive of the Second; Check with a High-Resistance Voltmeter before Making Connections to the Receiver



Above, Gang Type-Resistors for Use Where Compact Construction Is Required; Right, a Homemade Test Case for the Bench with Compartments for Tools and Accessories; the Dimensions Are Not Given as They Will Vary with Individual Requirements

Connecting Phones or Remote Speakers


PHONE JACK
SWITCH TO CUT OUT SPEAKER WHEN USING HEADPHONES
SWITCH TO CUT OUT SPEAKER WHILE USING HEAD SET
HEAVY WIRES CONVEY CURRENT TO FIELD COIL
OUTPUT RECEIVER
OPEN CIRCUIT JACK
TO PHONES

Left, Wiring Diagram between Set Output and Speaker; Right, Jack and Switch Mounted on Cabinet

A very simple method of connecting phones or remote speakers, and one that may be easily altered to suit receivers employing dynamic speakers, is shown in the sketch at the left. First locate the output terminal strip on the chassis. The correct terminal to which the phone jack should be connected, is quickly found with headphones while the set is in operation. The open-circuit jack is then connected across these posts without disturbing the original wiring. In most cases these terminals will have black wires connected to them. Trace one of these wires to a point near where it is connected to the speaker and cut the lead for a small switch to be used to cut out the speaker when the headphones are to be employed. The heavy wires indicated in the diagram are usually red and convey current to the speaker field coil. These are not disturbed. The switch and phone jack are mounted on the side of the cabinet, as shown at the left. Those desiring an additional speaker in another room need only plug such speakers into the jack and extend the leads as required.—Robert Macgregor, Bridgeport, Conn.

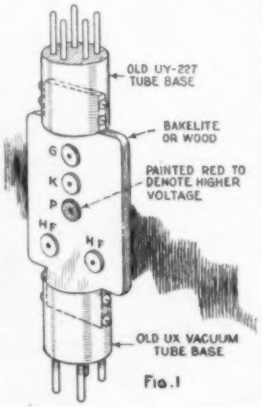
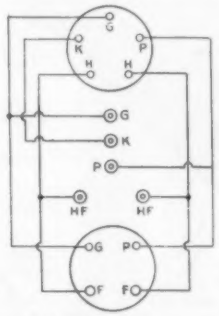


FIG. 1



TUBE BASE TERMINAL CONNECTIONS

FIG. 2

Left, Testing Device Showing Method of Mounting the Tube Bases; Right, Diagram of Connections

Black-and-White Television Pictures

Instead of pink-and-black images, which some seem to find objectionable, the latest television development from the DeForest laboratories is black-and-white pictures, produced by a new type of gas-filled, highly responsive source of white light. Not only are these pictures said to be more realistic, but, due to the greater contrast between shadows and high lights, far better detail is obtained.

Handy Universal Trouble Finder

This testing device is well worth the few minutes it takes to make it. As a universal trouble finder, the writer has found it very useful. The terminals mounted on the wood or bakelite form (see Fig. 1) may be either binding posts or midget jacks of the cord-tip type, and are connected as shown in Fig. 2. For testing voltages in the different stages of the set, remove the tube from the socket and plug in either the UX or UY-end according to the type of tube employed; for grid-voltage test, connect the voltmeter from G to F posts in d.c. sets and G to K in a.c. sets. For testing plate voltage, connect from P to F in d.c. sets or P to K in a.c. sets for type-*227* tubes. For filament voltage, test from HF to HF, using either a d.c. or a.c. meter according to the type of tube. To test the audio-amplification stages, connect headphones from G to F in a d.c. set or G to K in a set where the type-*227* tube is used. If the audio circuits are all right thus far, the normal signal will be heard in the phones, and if no sound is heard there is an open in between. Tests may be made in the first audio-tube socket and all succeeding stages.—Ross J. Plaisted, Brecksville, Ohio.

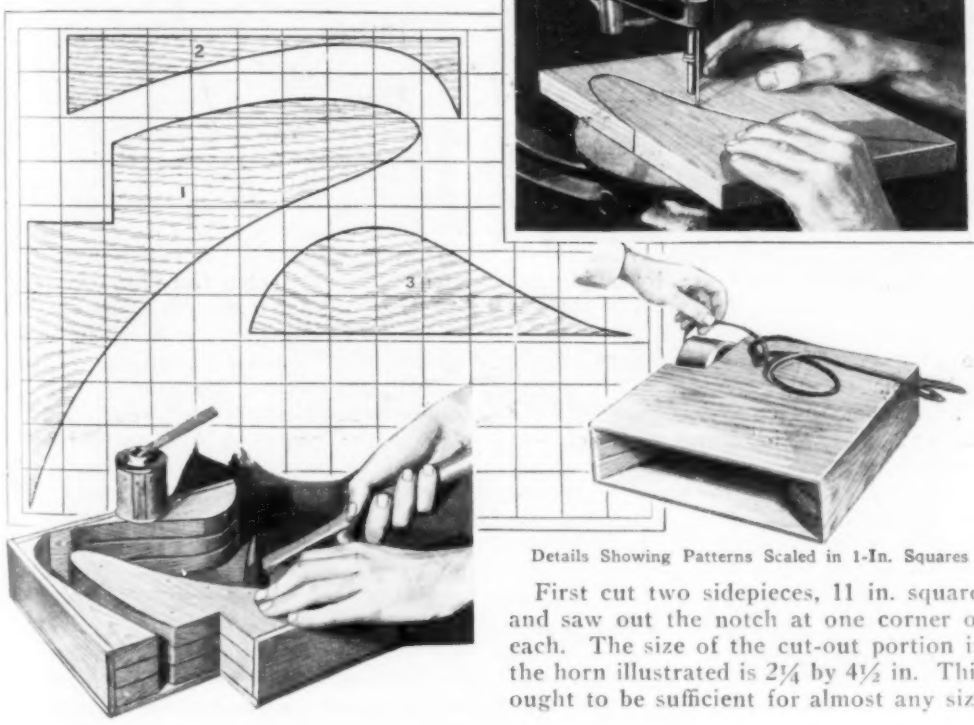
A Compact Speaker For Your Car

By Henry Hoyle

NOW that automobile radio receivers and other small portable or semi-portable sets are gaining in popularity, the problem of providing a loud speaker that is satisfactory from a quality standpoint, and at the same time is of small size, becomes important.

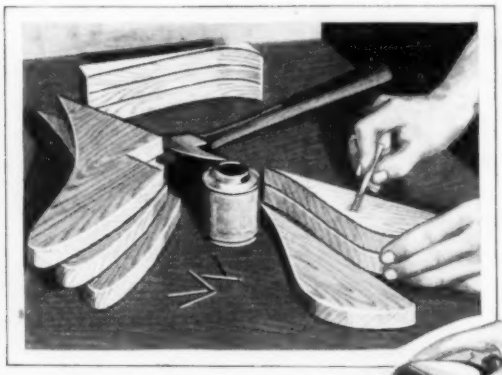
A cone speaker can be used in connection with an automobile set, but often the change of humidity of the air plays tricks with it. A horn is immune to moisture, and is at the same time inexpensive, the unit being the principal item of cost, that is, if you build your own horn—a task not at all difficult.

The speaker illustrated was built for use in the space behind the dashboard of a car. It consists of a balanced-armature horn unit, and a curved exponential, or air-column, horn built up of pieces of wood cut to shape on a jig or band saw. Outside dimensions of the horn are approximately 11 by 11 by 3⅜ in. A notch is formed at one corner to receive the speaker unit, although this can be omitted and the unit fastened to the outside surface.



Details Showing Patterns Scaled in 1-In. Squares

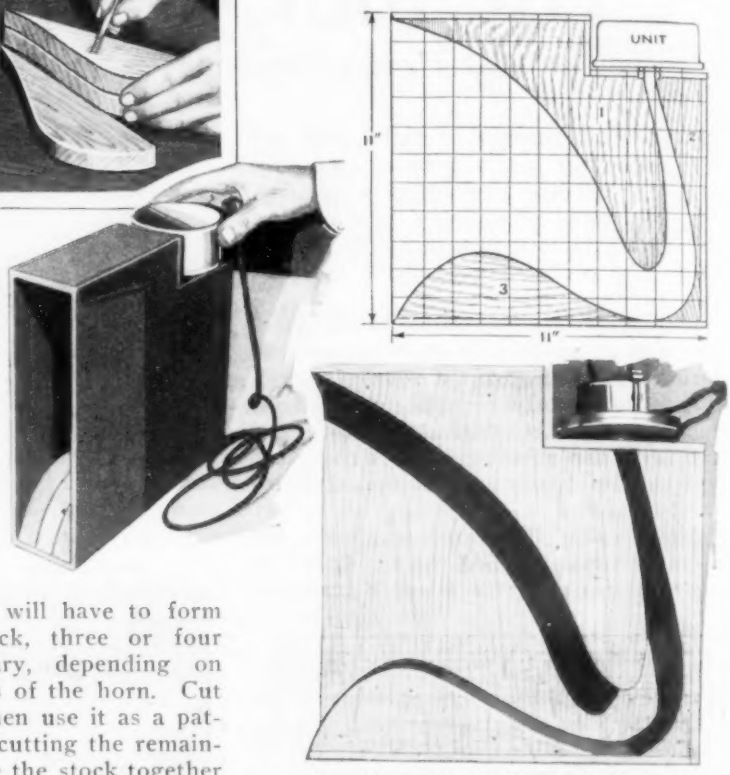
First cut two sidepieces, 11 in. square, and saw out the notch at one corner of each. The size of the cut-out portion in the horn illustrated is 2¼ by 4½ in. This ought to be sufficient for almost any size



of speaker unit. Next lay out the irregular-shaped patterns on the stock from which they are to be cut. There are three of these pieces, shown in Figs. 1, 2, and 3, page 305. If you have facilities and material, you can cut each from one thickness of wood. But more likely you will have to form them from 1-in. stock, three or four layers being necessary, depending on the ultimate thickness of the horn. Cut one piece first, and then use it as a pattern for marking and cutting the remainder. Or you can glue the stock together and make but one cut, this being the better method if you have the tools to do it properly.

If you have cut the sections from 1-in. material, assemble the piles by gluing and nailing. In fact, as you put the speaker together, glue and nail firmly each joint, so that possibility of vibration in the wrong place will be avoided.

Sandpaper the curved surfaces of the built-up horn sections, and give each two or three coats of shellac, sandpapering between each. Next cut the strips that form the edge of the box, leaving, of course, one side open for a sound outlet. These pieces can be ¼ in. thick and as wide as the built-up irregular pieces are thick. Glue and nail the strips to one of the square sides, and then fasten the three built-up blocks in place so that they form the horn. Shellac the surface of each of the two sidepieces where they cover the horn space. In the larger piece of wood that covers the surface of the notch, bore a hole of sufficient size to allow the loudspeaker unit to be screwed into it, the



Assembly Details and Photo of Completed Speaker Ready for Installing in the Auto

threads engaging the wood sufficiently to hold the unit firmly. Be sure that this hole comes opposite the small end of the horn. Finally, fasten the remaining side in place, and finish the entire speaker by painting, lacquering or covering with leatherette or similar material.

This speaker will work nicely with a simple well-shielded auto receiver, employing the new 2-volt tubes and additional features that will appear in early issues of Popular Mechanics Magazine. The sound is clear-cut, and the tone-range, while not including the extremely low notes because of the restricted size, satisfactory. In fact, a speaker of this rather high-pitched type gives better results in a car because the upholstery and limited air space have the effect of lowering the tone to a more natural pitch.

AMATEUR MECHANICS

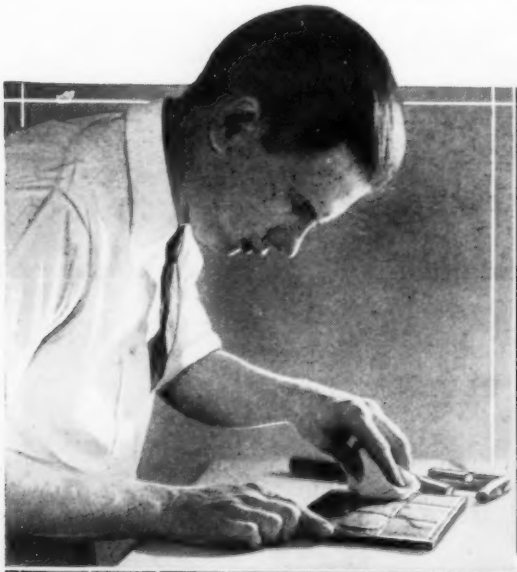
Artistic Wall Plaques of Hammered Brass

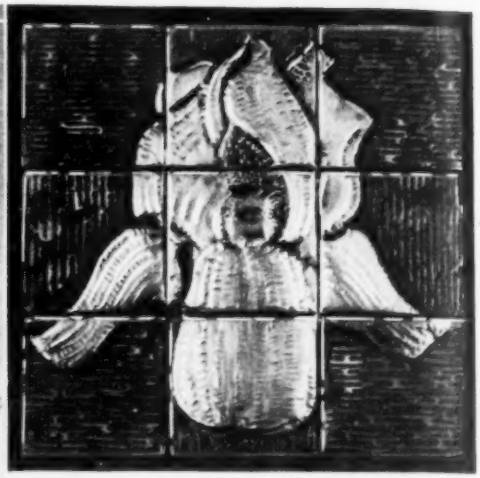
By A. C. ULLRICH

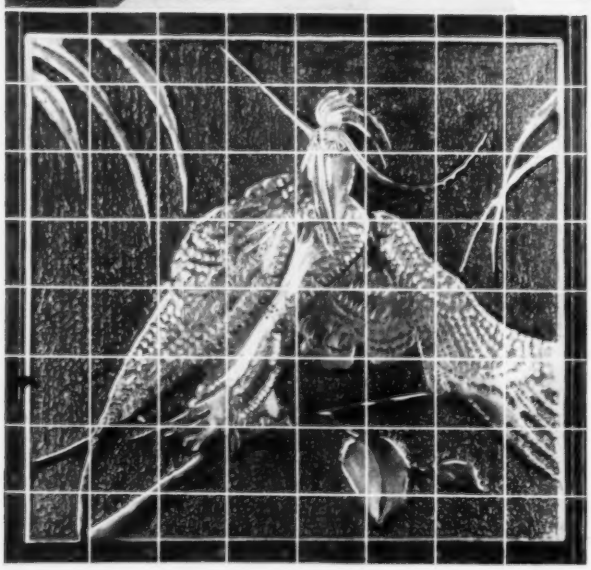
ATTRACTIVE plaques that make excellent wall decorations and at the same time furnish an unlimited choice of design, will have a strong appeal to the average home craftsman. Although the finished work looks quite intricate, it is really an easy matter to make them. Thin sheet brass, copper and aluminum are suitable for the purpose. Besides ornamental objects, more practical things, such as door panels, name plates, initials, house numbers, etc., can be made by this process, and for the pictorial effects almost any kind of design that suits the maker can be used, including flowers, animals, birds and even photos of persons, the latter furnishing the basis for highly attractive silhouettes.

The only tools needed for doing this kind of

Hammering Sheet-Metal Plaques Is an Interesting Pastime, Much Easier than Generally Believed, and Productive of Some Highly Attractive Effects







After Painting, the High Spots Should Be Wiped Off to Expose the Bare Metal, and the Surface Is Then Varnished

work are a few nails, about 3½ in. long, some brads, and a light hammer. The sheet metal should be about 35-gauge and is cut about ¼ in. larger than the design all around, to leave a border through which the finished plaque can be tacked to a wooden base. A temporary base of soft wood is used while hammering, the edges of the sheet metal being fastened to it with ½-in. brads. There should be no knots in this piece. The nails used for punching or marking are ground down at the ends to various sizes as shown in the detail, and, for convenience in working, they may be set in short pieces of broomstick after the head has been cut off. However, plain nails without handles are just as good. Three of the tools were ground down to 1/32, 1/16 and ⅛ in., respectively, while a fourth was ground down flat but not to a smaller diameter than the thickness of the nail. The sharp edges of the working ends should be carefully filed and made perfectly smooth with emery paper, as the slightest file marks and scratches on the ends of the tools will be transferred to the surface of the metal when hammering. In use, the 1/32-in. punch is handy for tracing and other fine tooling, the 1/16-in. punch for backgrounds and grooving, the ⅛-in. punch for hammering or raising the metal, while the full-size punch is suitable for raising the metal and making coarse backgrounds. One must, of course, be careful when hammering, not to punch through the metal, which is more easily done with the smaller punches than with the larger ones.

The first thing to do in hammering out a plaque is to outline the design and border with the smallest punch so that it can just be seen on the reverse side. This is

done while the metal is held on the temporary soft-wood base with two brads. After tracing the entire design, remove the metal from the base and turn it upside down so that you can hammer from the other side, thus raising certain portions of the design on the front. A separate soft-wood block may be used as a base when this reverse hammering is done, or, in some cases, it will be found better to use a heavy piece of wall insulation or even ordinary wallboard. Also, instead of hammering out a border, it may be found better to press it out by means of a round punch, as this method will not leave any tool marks, which are usually not wanted in the border itself. After the various portions have been raised, at least to some extent, the metal is again tacked to the temporary base, and the details of the design and the background can be hammered in. When this has been finished, it may be a good idea in many instances to turn the plaque over once more to go over the raised portions carefully, for, while doing the other work on the face, the edges of the raised portions are sometimes accidentally flattened out against the background.

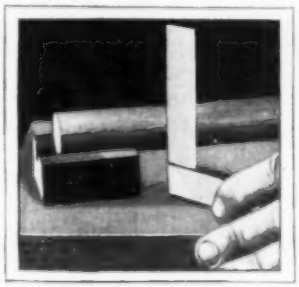
Coloring gives the finishing touches to the plaques, but before doing this, they must be mounted on a permanent wooden base, the edges of which may be beveled. First clean the surface thoroughly with a fine grade of steel wool or metal polish, the latter being preferable as it will not scratch the surface; then apply the colors, for which oilpaint will be found suitable. The high spots of the metal can be wiped clean for effect. As soon as the paint has dried, apply a coat of varnish to prevent the bare metal from tarnishing and to impart an even gloss to the entire surface. Another method of coloring copper and brass is with the use of chemicals. Black can be obtained by applying a solution of liver of sulphur in a very small amount of water, or by soaking a wadded rag and rubbing this over a piece of liver of sulphur and then rubbing the metal surface. A verdigris finish for brass and copper can be obtained by mixing some salt in a small quantity of ordinary vinegar and applying this to the metal, leaving the solution standing on the surface for some time.

Stippled Backgrounds in Various Colors Add to the Beauty of These Plaques

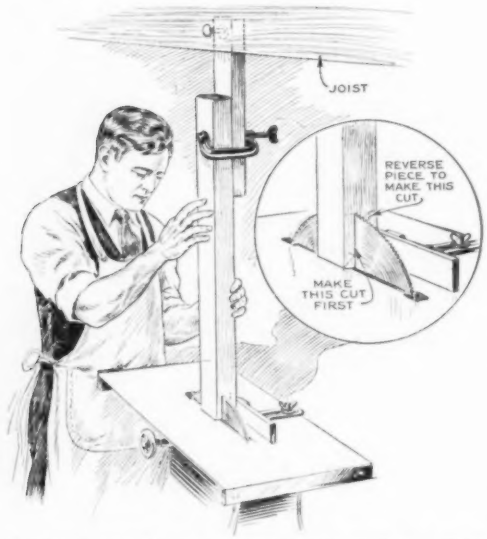
Two plaques shown in the illustrations are divided into squares each representing 1 sq. in. If you like to make these, first lay off the 1-in. squares in actual size exactly as shown, and then it will be an easy matter to draw in the design.

Steel Square for Marking Shafts

For scribing lines on opposite sides of a shaft, a square, used as shown in the illustration, will often be found more convenient than a surface gauge. Apply chalk or bluestone (copper sulphate) to the surface in the usual way, put the shaft in two V-blocks and set the square on the surface plate at a slight angle against the work to get a better mark. Then, by drawing the square along the shaft on each side, two lines will be scribed exactly opposite each other, as the edge of square marks through the chalk or bluestone. This method saves much time at no expense in accuracy.—Harry Moore, Hamilton, Can.



Sawing Joints on Home Woodworking Outfits

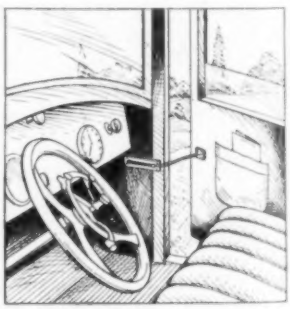


Pivoting Long Pieces to a Joist Above Enables Worker to Cut Slots and Tenons with Small Saw

Seemingly impossible operations are often within the scope of the average motor-driven woodworking outfit in use in many home shops. Slots and tenons in the ends of framing to make lock joints can be cut with it. The low fence of the average saw makes it practically impossible to hold a 5 or 6-ft. board in a perpendicular position while the cuts for a lap joint or tenon are being made through the lower end. However, to do this job quickly and accurately, the method illustrated has been found convenient. The fence is set at the correct distance to make the cut for one side of the slot or tenon. From one side of a joist directly above the saw, and running in the same direction as the rip fence, a plumb line is dropped so that the point of the bob rests on the edge of the face of the fence, at one end. The plumb line is then moved along the fence of the joist and the other end of the fence lined up. Thus the side of the joist is accurately in line with the face of the fence. A piece of 2 by 4-in. stock, having a straight edge, is pivoted to the side of the joist as indicated, the pivot being directly over the center of the saw blade. A large nail, driven in not too snugly, serves well as a pivot. The piece to be cut is clamped to the right-hand face of the pivoted piece so that the lower end just slides on the saw table. Make the cut, holding the piece firmly against the fence. If the fence has been properly set, the piece can be reversed on the pivoted member and the other side of the slot or tenon cut in the same way. This method gives the top of the cut a slight curvature as the piece swings on the pivot above, but if the depth of the cut has been set just a shade under the exact depth required, this will be straightened out when the crosscut is made for the tenon, or the chisel cut in the case of a slot. The length of the pivoted member may be proportioned to the length of the piece to be cut, but on all jobs an overlap of at least 1 ft. should be allowed. If the swinging piece is long enough to come within an inch or two of the fence, pieces of almost any size can be cut. The swinging piece can be hooked up when not in use. In setting the fence for the slot or tenon cut, it is well to set it so that the cut will be made on the side of the slot or tenon farthest from the fence,reversing the work for the second cut.—A. V. Comings, Philadelphia, Pa.

Ventilating Closed Cars

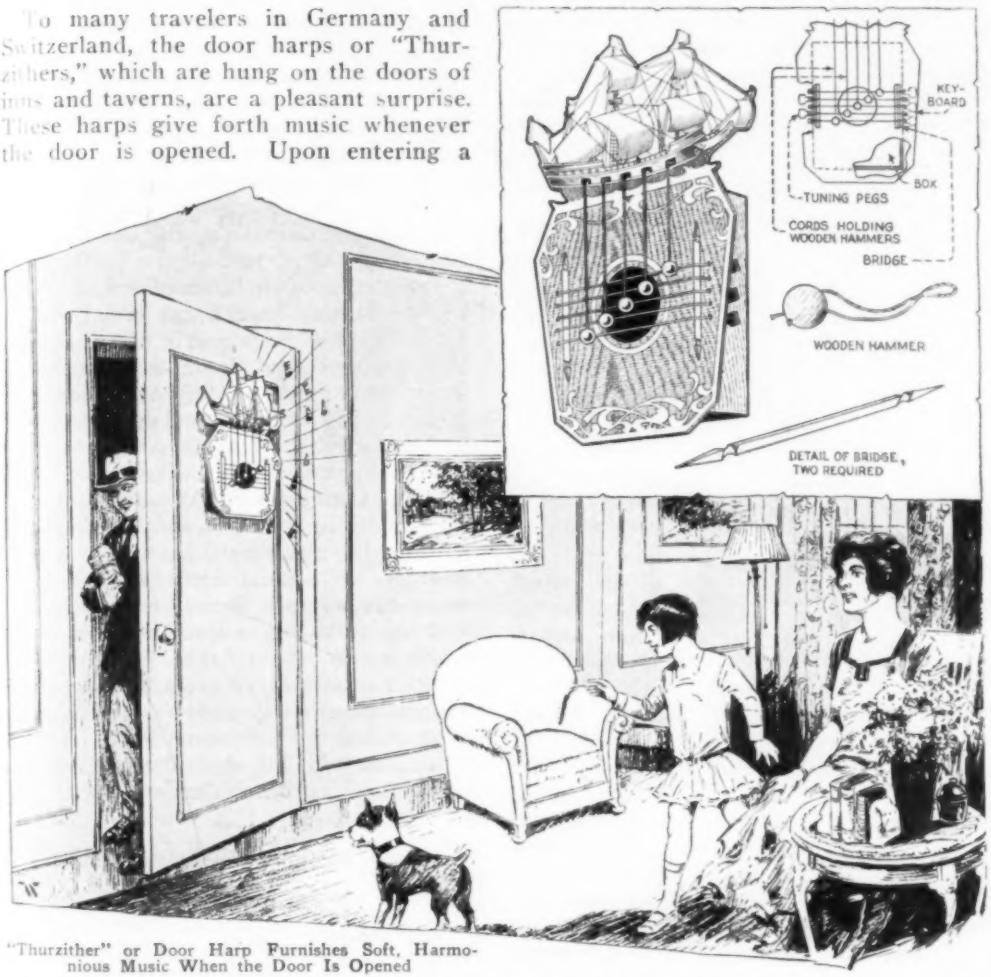
On automobiles where the door opens toward the front it is an easy matter to obtain ventilation while driving by installing an ordinary door chain of the kind indicated, which can be had at any hardware store. With the use of such a chain the door will be held open a few inches which permits it to catch plenty of air and at the same time prevents it from swinging open entirely.—J. A. Swank, Dayton, Ohio.



¶When erasing a sheet of typewritten copy, always slide the roller over toward one side to prevent particles from falling into the mechanism of the typewriter.

DOOR HARP IS PLEASANT NOVELTY FOR THE HOME

To many travelers in Germany and Switzerland, the door harps or "Thurzithers," which are hung on the doors of inns and taverns, are a pleasant surprise. These harps give forth music whenever the door is opened. Upon entering a

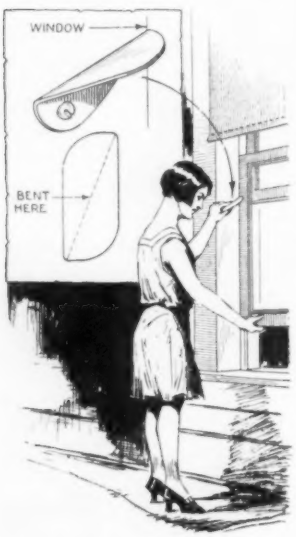


"Thurzither" or Door Harp Furnishes Soft, Harmonious Music When the Door Is Opened

tavern, soft music, resembling the mellow strum of a mandolin, greets the ears, the melody seeming to come from everywhere. Although some of these musical novelties may be very elaborate in construction, they can easily be made at home. It is possible to make one from a cigar box. Nail the cover down and cut a sound hole in the center of the cover. Glue down two strips of wood for bridges on the front, near the edges, one on each side of the sound hole. Next whittle five tuning pegs and drill holes for them in the sides, as shown in the detail, so that three pegs will be on one side of the instrument and two on the other, allowing a maximum space for manipulation of the pegs. String the harp with violin or mandolin strings. Nail a ½-in. square strip of wood horizontally across the face of the box, near the top. Tack five pieces of string on this support, about ¾ in. apart. String a wooden bead to the bottom of each cord. The cords should be of varying lengths so that each bead strikes only one string. The varying lengths of the cords cause the beads to swing at different amplitudes so that one note succeeds another. More elaborate door harps may be made by removing the cigar-box cover and replacing it with a large panel of the same thickness. The panel should be large enough to conceal the sound box completely. In this case the strings are led to the pegs through holes drilled in the panel. The harp will stay in tune for a

long time if the peg points are sprinkled with a little powdered rosin, so that they will not slip. For a soft, sweet tone that is deep and resonant, make the harp from a large, deep cigar box and use violin D-strings. For a louder tone, use a shallower box and use mandolin D or A-strings.—Alexander Brown, Toledo, Ohio.

Automatic Lock Holds Windows Open

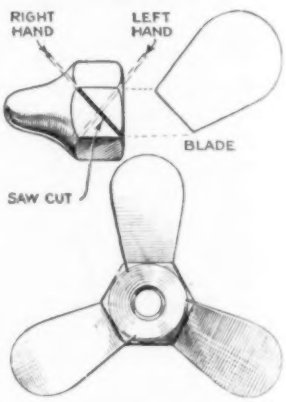


In houses where the windows are not balanced with sash weights, the problem of finding some object of suitable size to hold the window up is one of the minor but very frequent annoyances with which the busy housewife has to contend. To overcome this, the lock shown in the drawing has been found highly useful. The window has merely to be lifted to the desired height and then released, which will cause the device to fall against the sash frame and hold it securely. The detail shows exactly how this lock is cut from a piece of sheet metal, drilled near one end and then bent. To release the window, raise it a little and with the free hand swing the holder clear of the sash frame and let the window down easily.

Tips for the Amateur Photographer

Many solutions are affected by light and it is not always easy to obtain amber-colored bottles in which to keep them, especially if large containers are needed. Black lacquer applied to ordinary glass vessels or jars has been found an even better protection than the amber color. Paper labels on bottles are easily washed off and quickly made illegible from drops of solution getting on them. Adhesive tape is superior to paper and can be labeled with either pen or pencil. A strip of adhesive tape is also handy for graduating bottles. For example, if you wish to put 32 oz. of liquid in a bottle, measure this amount out carefully, place the bottle on a level surface and then stick the tape on the side, so that the top edge comes even with the surface of the liquid. When it is required to make up the same amount some other time, just fill the bottle up to the top edge of the tape. Corks in wide-necked bottles soon break and then the bottles cannot be properly closed so that they are air-tight. It will be found much better to use rubber plugs made for lavatory basins, which can be obtained in various sizes at a small cost. As they are equipped with a ring it is easy to insert or remove them. Washing prints is often done in the home bathtub. When transferring the prints from one dish to another, each print must be held up to drain the water. This is a tedious task and the following method will be found much more convenient: Just stick the prints to the side of the tub. They will adhere immediately and, by the time you have placed the last print on the tub the first one will be well drained.—F. A. Shrimpton, Toronto, Can.

Easy Method of Making Model Propellers



For model-boat propellers a very simple construction is shown in the illustration. Get a brass hexagon nut and saw a groove diagonally across three sides as shown. Blades are cut from a piece of sheet metal of such thickness that it will fit snugly in the slots. It is then an easy matter to sweat the blades in the grooves. To obtain a still finer adjustment of pitch than is given by the

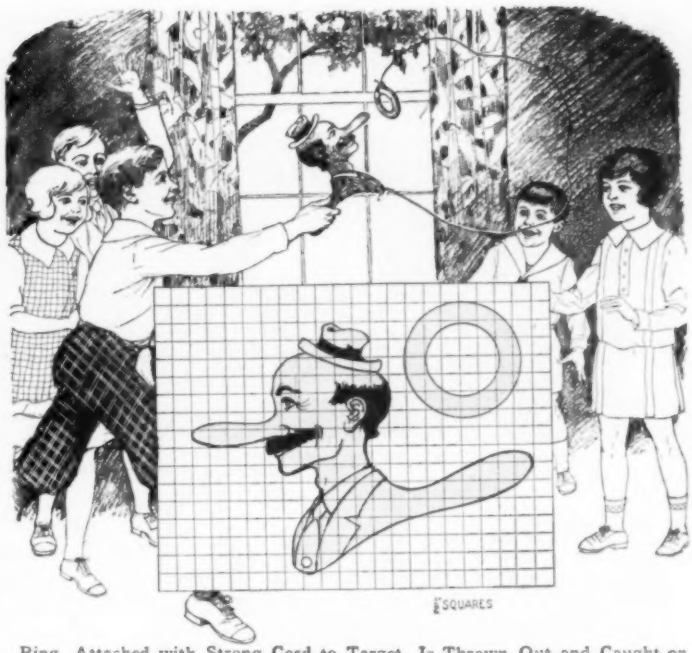
diagonal slots, merely bend the blades over a trifle. The nut must, of course, fit on the end of the driveshaft, which is threaded for the purpose.—P. H. Stanley, San Francisco, Calif.

Installing Extra Horns on Ford Cars

An additional horn, having one or two terminals to which the wires are connected, can be installed anywhere on your Ford. The wires from the present horn are merely extended by splicing additional lengths to their ends. A horn having only one terminal can be connected to a two-terminal horn if the extra horn is mounted on an insulating bracket. In this case, one of the two wires is connected to the single terminal, while the other goes to the horn case. As an insulating bracket is rather difficult to attach to the tie-rod between the front fenders, it will be found easier to install it under the hood on the left side of the frame ahead of the steering gear. A wood block will serve the purpose. When installing a horn, it is best to reverse the connections in order to discover in which way the horn will work best.—E. T. Gunderson, Jr., Humboldt, Iowa.

"Ring-My-Nose" Toy Provides Indoor Amusement

Although a ring target in the form of a face with a nose of extraordinary dimensions is not entirely new, the toy described here is different in that it combines the elements of the usual ring toss and cup and ball. The coat which forms part of the target is elongated at the rear, forming a handle. The exact shape can be laid out from the cross-section drawing, whose divisions represent ½-in. squares. The scarf pin is drilled out large enough to form a tie hole for the cord. The nose should have the sharp edges rounded off with a rasp, and the whole head is carefully sandpapered before applying the paint. The head is painted flesh color, with the nose tipped in red. The features are outlined with black, while the eyes are painted blue. The collar is white, the tie green, and the coat black. A green hat with a black band makes a good contrast. The ring can be cut from ¼-in. three-ply veneer or a wooden curtain ring will serve the purpose. The ring is fastened with a strong cord about 2 ft. long. If the cord is too long the game will be too difficult and if it is too short the ring can be caught too easily. The exact length should be determined by experiment in the hands of a child for whom it is intended. To use the toy, hold it by the handle and with a sweeping motion toss the ring into the air and try to catch it on the nose. With patient practice skill in the game soon is acquired. In competitive use, a score may be kept, striking the ring with the head, for instance, counting one; hanging it on the hat, three, and catching it on the nose, five.—Herbert C. McKay, Brooklyn, N. Y.



Ring, Attached with Strong Cord to Target, Is Thrown Out and Caught on the Projecting Nose

¶Wooden candles for mantel candlesticks are just as good-looking as tallow candles but are not affected by heat.

"ROAMER" A Cruiser

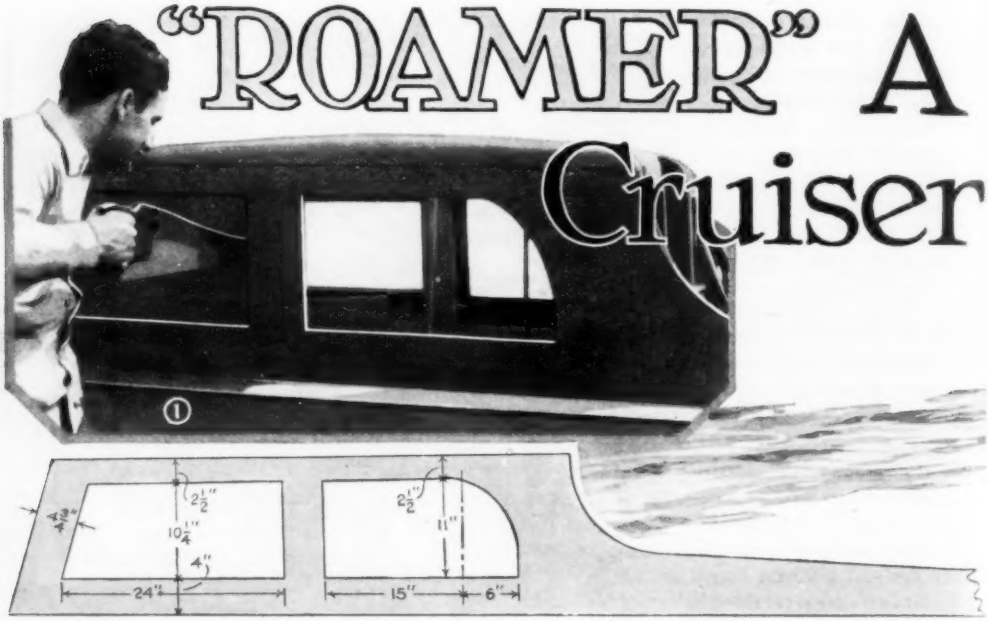


FIG. 2 OPENINGS FOR WINDOWS

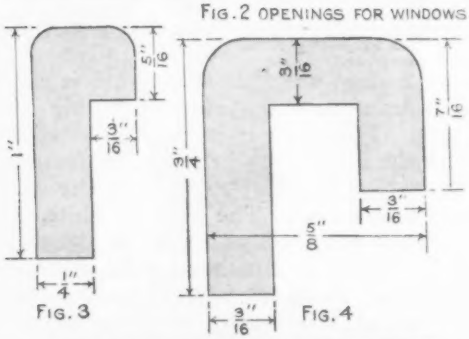


FIG. 3

FIG. 4

WELL, here we are on the "last long mile." The beginning of the end starts with the cutting of the cabin windows. These are to be cut in each sidewall of the cabin according to the diagram shown in Fig. 2, and in the manner shown in Fig. 1, using a wood bit to start the opening in each corner and then joining the holes with a saw.

Molded strips of mahogany are necessary for the window trim, and these strips will probably have to be cut out at the local lumber mill unless you own one of the small woodworking machines now so popular. At any rate, you will need about 23 ft. of the shape shown in Fig. 3, and 23 ft. shaped as in Fig. 4. Pieces of the Fig. 3 shape are neatly mitered to fit the edge of each window opening, being inserted from the outside and screw-fastened to the cabin sides, as shown in Fig. 5. The curved pieces for the after edge of the rear windows must be thoroughly steamed before they can be fitted into place.

The inside trim strips, Fig. 4, are likewise mitered to fit, but the top and bottom piece of each window must be shaped in a long curve on one edge in order to fit the glass. Here's the idea: You have a cabin side which is considerably curved fore and aft, especially at the forward end. You cannot expect the double-strength

Speedy Outboard

Part 5

by Sam Brown

FIG. 6

glass to take this curve, so you put the curve on the wood and let the glass go its own straight way. Look at Fig. 6. It shows how the bottom piece of one window is shaped before fitting. The long lip A of the molding is what you must cut. Consider, now, the same piece fitted into the window, as in Fig. 7; it is pressed against the cabin side, and, consequently, takes the same curve. You will notice, in Fig. 8, that the curved lip straightens out, giving a straight edge on which to back the glass. The actual amount of "curve" on each piece can easily be found by fitting the strips into the window frames, and then marking a straight line across the face of the piece to represent the "glass line."

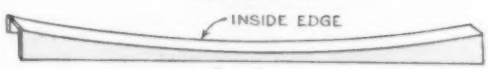


FIG. 8

Putting the glass in the window frames is quite simple. Each of the panes should be set in seam composition and then fastened permanently into place with light strips of window molding on the outside. Fig. 9 shows one of the forward windows completed. Fig. 10 is a detail section of the same window and trim.

DETAIL OF WINDOWS

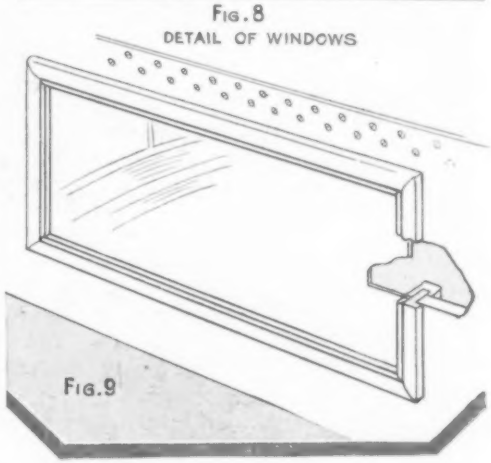


FIG. 9

Unusual as it may seem, you start putting on the roof by taking part of the roof out entirely. That is, you will saw off each inside (door end) of the rear cabin pieces so that they will be ⅞ in. in from the face of the door trim. The center portion of each of the three cabin beams immediately forward are then sawed out in line with the ends of the rear cabin pieces, to make the opening shown in Fig. 11. Two temporary lengths of ⅞-in. lumber are used to face the ends of the cut

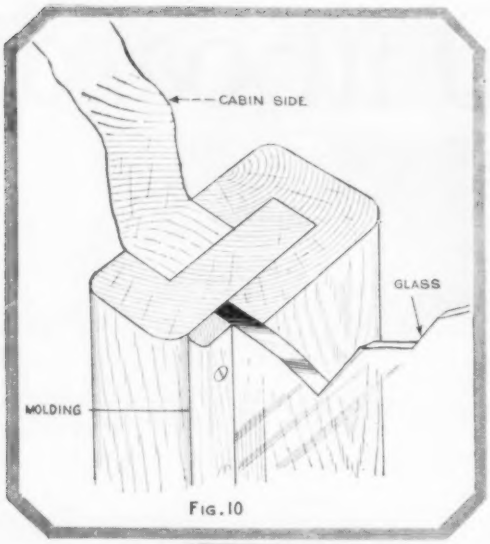
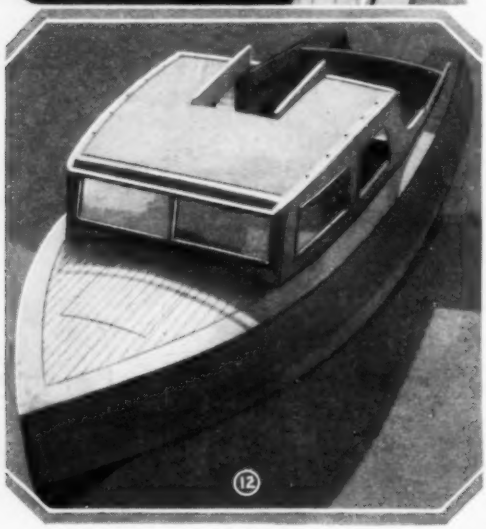


FIG. 10

⑪



⑫

beams, as shown in Fig. 12; and the cabin top is nailed into position. Composition wood fiberboard is used, the three pieces necessary being fitted into place according to the photograph.

Leaving the cabin top for the time being, let's consider the wiring system of "Roamer." Fig. 13 gives the schematic diagram. The battery is to be located in the starboard (right) locker compartment. This should be a 12-volt battery, to handle one of the large electric starting motors. Holes are cut in the side of the motor well to allow the passage of two wire cables to connect the battery to the motor. All other battery-operated accessories on the boat need but 6 volts, so you will tap just half of the voltage of the battery to furnish current for these parts, as shown in Fig. 14. This 6-volt line is carried forward under the coaming to a common terminal on the inside of the cabin immediately below the steering-wheel shaft. The control switches are located immediately above the common terminal, but are mounted on the outside of the cabin, directly above the steering-wheel post. From the common terminal and from the switches are run the various wires which lead to the lights and to the horn. "Roamer" uses two cabin lights of the small wall type found in sedan automobiles. A hole is chiseled into each of the center cabin supports and the light let in. Necessarily, the wires will be run through grooves cut on the face of the center cabin support. These supports are to be faced later with light pieces of veneer, so don't get the impression that this is going to spoil the interior appearance of your boat.

The wires for the starboard cabin light are run across the roof over the main beam. A slight gap should, therefore, be left in the composition roofing to take these wires. The wires for the electric horn, which is to be mounted atop the cabin, are run up the face of the forward upright. Notice in the schematic diagram that a plug for a "trouble light" is installed inside the battery compartment; also notice the main-line switch which cuts off everything except the motor. Pay a dollar or two to have the wiring put in if you are not familiar with the job.

Before going back to the roofing business, let's consider five or six little jobs

which must be done. The first of these consists of putting in a curved strip of 3-in. wide mahogany to face the end of the deck which juts into the cabin, as shown in Fig. 15. This strip should be screw-fastened. In the same photograph, you can see the top of the quarter-round piece which finishes the lower inside edge of the windshield frame. This is likewise screwed in place. With this piece of quarter-round in place, you can calk the cabin sides. This consists of driving eight or ten strands of cotton wicking into the seam between the cabin side and the boat deck, as shown in Fig. 16. A blunt chisel makes a good calking tool. The calking process should continue entirely around the cabin. Lengths of ½-in. quarter-round are then fitted around the seam, to give a finished appearance. Regardless of the intended finish of your boat, these strips look best painted red; and to that end they should be but temporarily fastened in order to obtain a fit, and then removed for painting.

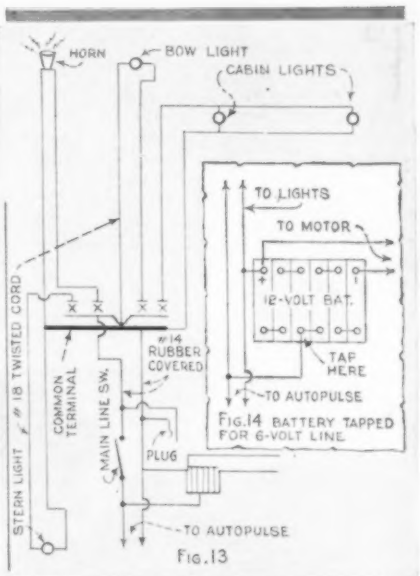
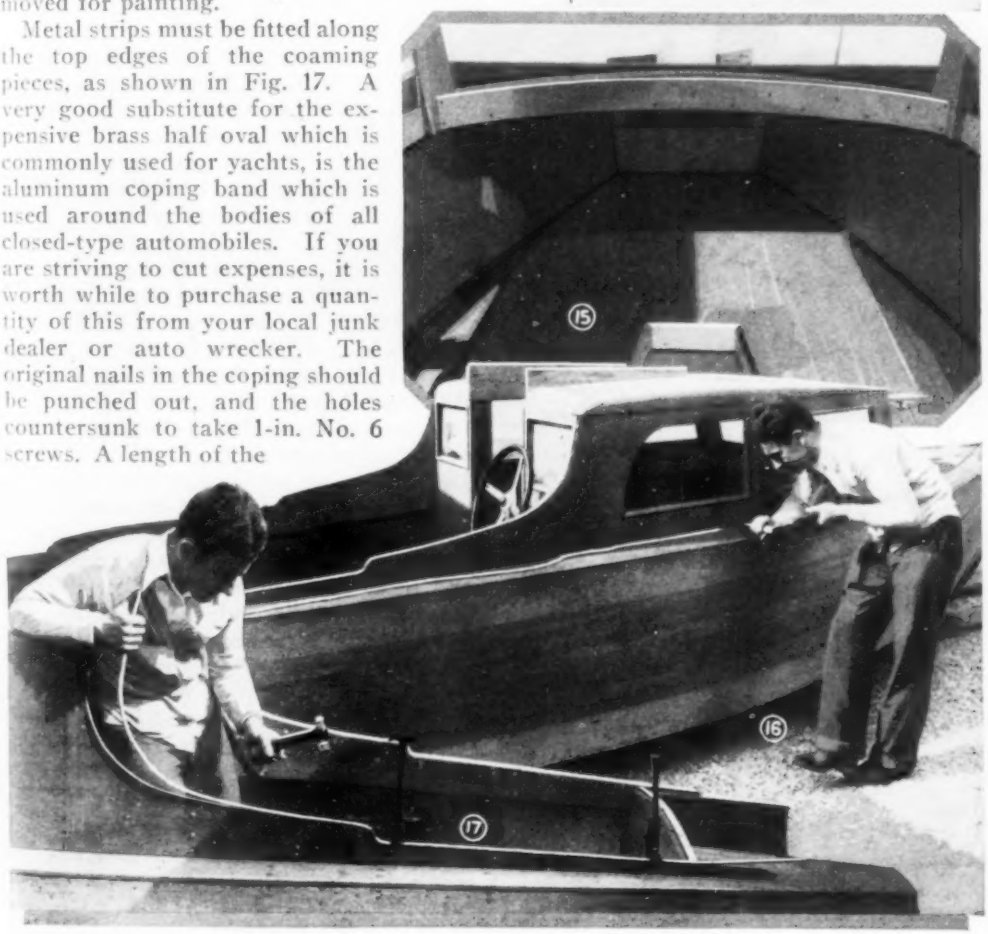


Fig. 14 BATTERY TAPPED FOR 6-VOLT LINE

Fig. 13

Metal strips must be fitted along the top edges of the coaming pieces, as shown in Fig. 17. A very good substitute for the expensive brass half oval which is commonly used for yachts, is the aluminum coping band which is used around the bodies of all closed-type automobiles. If you are striving to cut expenses, it is worth while to purchase a quantity of this from your local junk dealer or auto wrecker. The original nails in the coping should be punched out, and the holes countersunk to take 1-in. No. 6 screws. A length of the



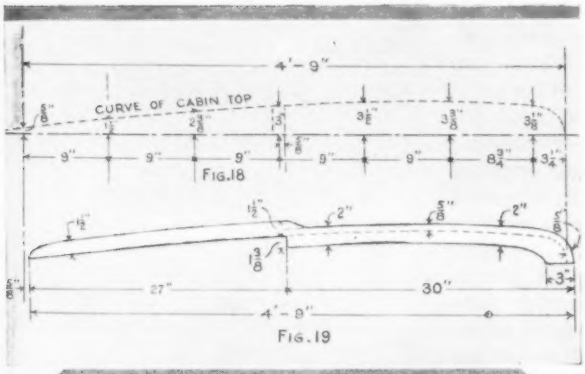


FIG. 18

FIG. 19

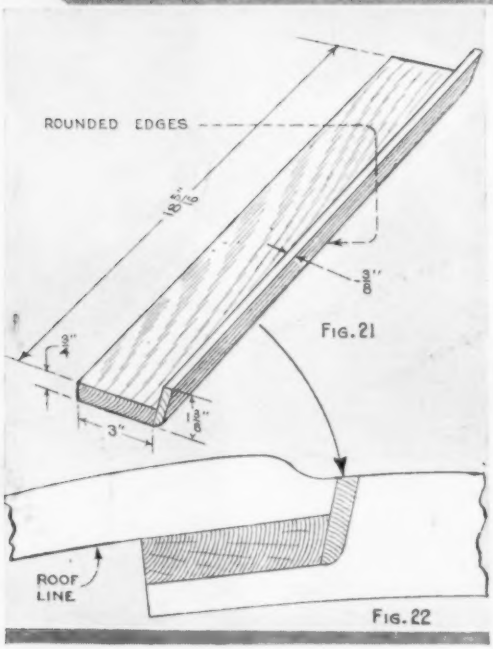


FIG. 21

FIG. 22

coping material should be fastened across the forward edge of the motor well. You should also purchase two 7-ft. lengths to face the rubbing strips which are to go on the boat later, and two extra-wide 6-ft. lengths for the hatch slides.

Now for the finishing of the cabin top and the sliding hatch. The fiberboard top is already in place, and all wiring connections are fastened. The next thing to do is to cover the top with the regular topping material as used on automobiles. This should be brought down far enough along the sides to cover the top row of screws on the cabin sides; forward it should be carried over the sun visor and tacked on the underside. The tacked edge, all around, should be finished with leather, "concealed-nail" molding, as used on automobiles, or with pieces of light half-round wood. Neatness is the big thing. With that in mind, and knowing that the idea is to cover the top of the cabin, any man should be able to put on the top leather without much trouble. The topping material should not be cut off flush with the hatch opening, but should extend at least 3 in. into the gap to permit trimming later, when the permanent hatch slides go into place.

These permanent hatch slides are shaped according to the diagram shown in Figs. 18 and 19. You will notice that the shape of the slides is dependent upon the cabin roof line. The slides should be screw-fastened to the cabin beams, the forward end being fitted over the leather top and screwed from the underside, and the rear end from the side into the cut ends of the beams. The top edge of each slide should be faced with a strip of aluminum coping, as shown in Fig. 20, and these strips should be so placed as to extend about ¼ in. over the wood toward the outside of the boat, forming a lip. The topping around the opening is glued to the sides of the slides and then the metal strips are screwed down on top.

The forward end of the hatch opening

is fitted with two pieces of wood, fastened together as shown in Fig. 21, and then wedged between the hatch slides at the position shown by the section in Fig. 22, immediately behind the main cabin beam. The topping extends up to the riser strip on this piece.

That completes the hatch slide. Making the hatch cover is a matter of a wood and metal framework, as shown in Fig. 23, which is then covered with wood, as in Fig. 24. You will notice that all but 2 in. of this covering extends 1¼ in. beyond the hatch-lid framework. In other words, the hatch framework should fit snugly between the hatch slides, while the ends of the wood covering pieces should come flush with the outside edges of the metal strips which top the slides. Lengths of ⅛-in. wide strap iron, fitted with rivets at either end, as shown in Fig. 25, and shaped to fit, are screw-fastened into notches cut across the hatch lid at either end, as shown in Fig. 26. The rivets on these pieces are meant to catch under the lips of the hatch coping strips, as shown in Fig. 27.

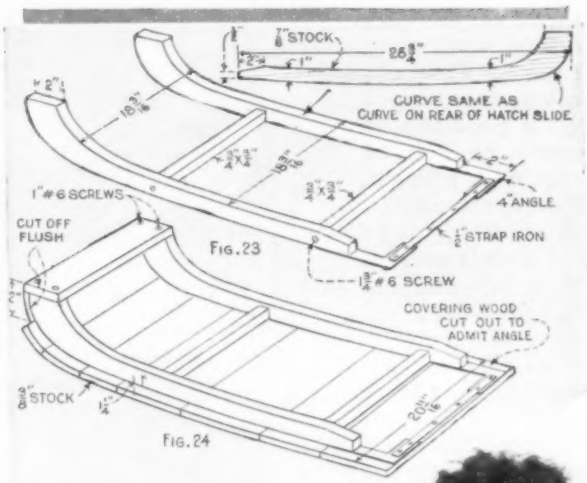


Fig. 23

Fig. 24

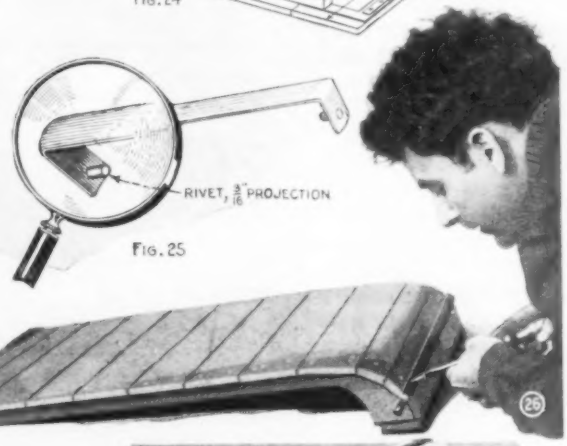


Fig. 25

The hatch lid is, of course, covered with topping like the remainder of the roof, and should be fitted with a handle at the rear end. All of the rubbing edges of the hatch lid and slide may be faced with thin lengths of brass, but this is not absolutely necessary.

A word about steering: Fig. 28 shows how the cables are installed from the steering-wheel drum to the motor. Double and single sheaves are used to carry the tiller cables as indicated. Detailed information about rigging the lines can be obtained from the company furnishing your motor or steering equipment.

You will, naturally, have the rear seat upholstered, and a cushion or cushions made to fit. These should be of leather, kapok-filled, and should be made with straps in order that they may qualify as life preservers. The double cushions for

the bunks are made on the same order. Looking into the cabin, Fig. 29, you get a good idea of how the bunks should appear. Notice, too, in this photograph, that the floor is covered with linoleum, and that the loose plank down the center is faced all around with brass edging strips.

A feed line must be carried from the large gasoline tank under the seat to the motor. This usually calls for an "autopulse" fuel pump which can be mounted in the battery compartment. The feed line should be provided at some point along its length with a quick-action joint to allow ready uncoupling in case the motor is to be removed. Air holes, fitted with fine brass screening, should be drilled in the transom board to carry away fumes rising from the surging gasoline in the tank.

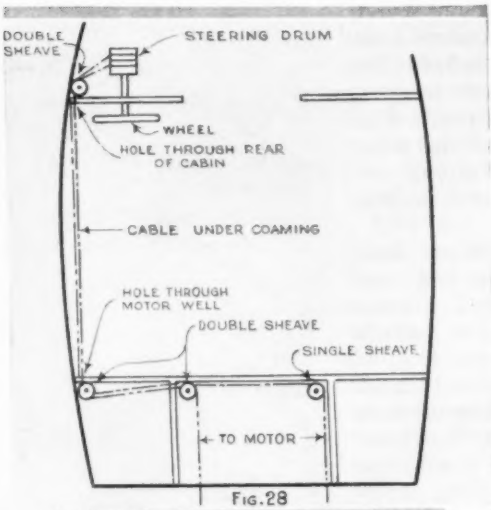
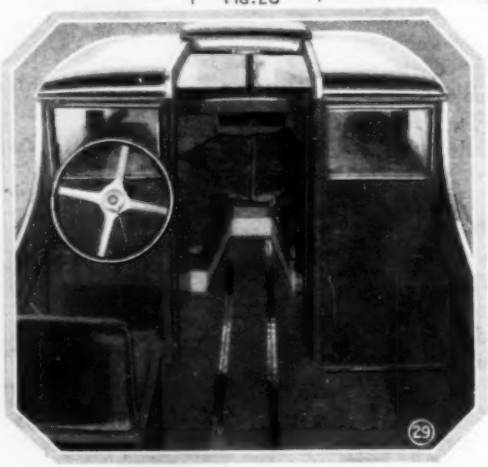
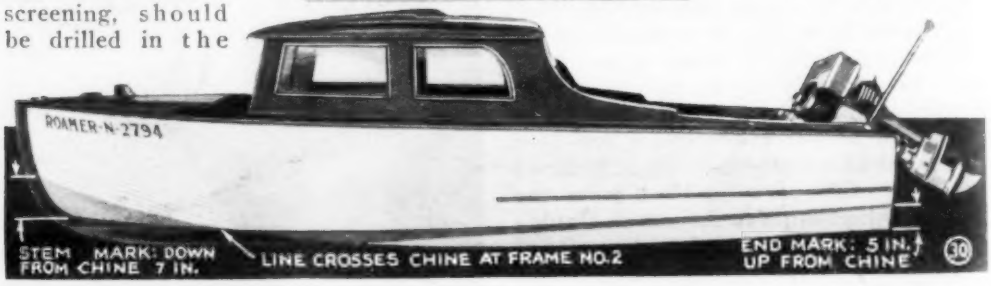


FIG. 28





"Roamer" looks best painted white. The original craft has four coats of green bottom paint up to the waterline. The sides were given two coats of white lead and oil, then two coats of white lead and turpentine. The latter mixture is somewhat chalky and washes away slowly, making the boat remain clean-looking.

Before grabbing a brush, however, the waterline must be carefully laid out according to the marks shown in Fig. 30. A chalked line, drawn tight, and snapped through the three points will give you an accurate waterline for painting purposes, the actual waterline being 2 in. below this. Rub streaks, of 1-in. square wood, 7 ft. long, must be fastened to each side of the boat at the rear, 6 in. above the painted waterline. These pieces must be metal-faced and can be seen in Fig. 30. Obviously, the purpose of the rub streaks is to protect the sides of the boat when the craft is riding at anchor alongside a pier.

For a similar reason, fender streaks are necessary along the upper edge of the planking. These are 1½-in. half-round mahogany, and, since they are not subjected to as much wear as the rub streaks, need not be metal faced. Because these fender streaks mark the division of white siding and varnished deck, they should not be put on until the painting is finished.

Going back to the paint, the deck and cabin should be finished natural with three coats of spar varnish. Oil stain may be used if you wish to darken the wood. The cabin interior looks best painted cream, with trim of natural-finish mahogany. As mentioned before, some of this trim is the 3/16-in. mahogany paneling which is used to face the cabin uprights.

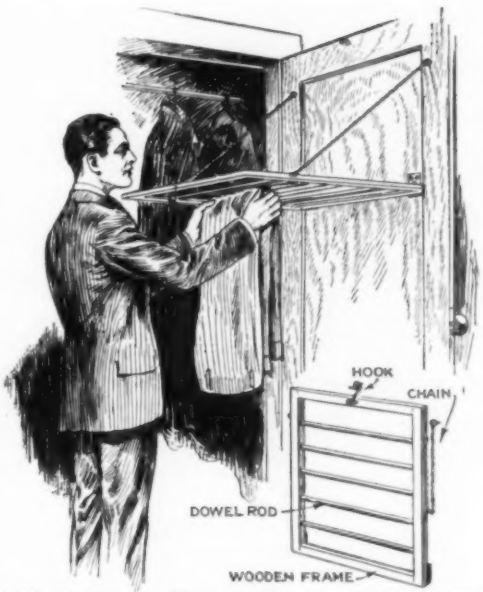
The nose, that is, the stem, can be finished in a number of ways. Some protection, of course, is necessary since the bare wood would rapidly split off from constant bumpings. Metal noses can be purchased in nickel, brass or copper from various concerns, but are quite expensive. The cheapest way to do the job, and one which is quite effective, consists in capping the stem with a strip of ½-in. brass half-oval. This is securely screwed to the forward edge of the stem and carried about 6 in. under the keel.

As to equipment, the law requires that a boat of this size should carry a combination red-and-green light forward, a white light aft, a means of extinguishing burning gasoline, life preservers for all passengers, a whistle or horn, two sets of pilot rules and a number. The pilot rules and the number can be obtained free of charge by writing the collector of customs at the port nearest your home town. Full equipment is not necessary when operating on small inland rivers and lakes. Play safe, however, by getting the pilot-rule book and reading up on the subject.

In addition to this compulsory equipment, you should carry a pair of oars, with the oarlocks mounted on the top edge of the coaming. Two chocks should be fastened at the forward end of the deck, with a large cleat immediately behind them. Two smaller cleats, one on either side at the rear, are also necessary. Various other gadgets may be added if expense is immaterial. And that's all.

Trouser Holder Utilizes Waste Space of Closet

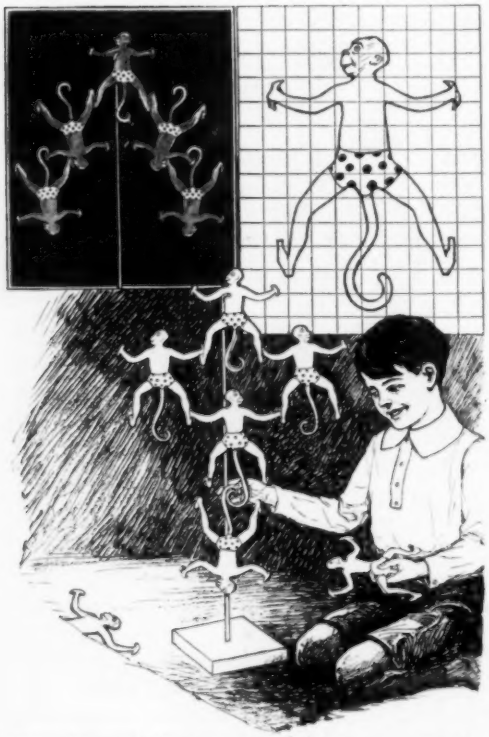
In homes where the bedroom closet space is rather limited, the illustrated trouser holder, which folds against the closet door, will be found useful. It consists of a square frame having a number of dowel-rod crosspieces, which fit in holes drilled in the side members. The whole is hinged to the closet door as indicated so that it can be swung upward permitting the door to be opened and closed. Two lengths of light brass chain are attached to both the door and the holder to prevent it from dropping lower than a horizontal position, and, when folded, is securely held in the vertical position by means of a hook.—Wm. P. Mack, Chicago.



This Hanger for Trousers Fits Snugly against the Closet Door

Tumbler for Honing Razor Blade

Double-edge razor blades can be honed on the inside surface of an ordinary tumbler, as shown in the illustration. The tumbler should be about 3 in. in diameter and free from defects, which might spoil the blade. I have used the same blade for over a year and its edge is still in good condition.—Henry N. Grenier, N. Cambridge, Mass.



These Plywood Monkeys Can Be Hung in an Endless Variety of Positions

Plywood Monkeys Prove Amusing

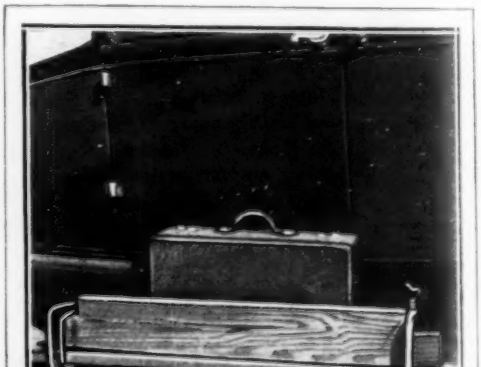
Capable of being arranged in a variety of positions, the plywood monkeys shown in the illustrations, afford considerable amusement. While the drawing gives a good form for the figures, other forms can readily be developed. A suggested variation is to place a cap on the head, the cap tapering into a hook corresponding to the tail hook. Plywood, ¼ in. in thickness, has been found suitable for cutting these figures, which is done by means of a jig or scrollsaw. The hands should form hooks at an angle of less than 90° with the forearm. The ankles should be less than 45°, while the tails form a full hook. The bodies are given a coat of brown, and, when this is dry, the trunks are painted in various bright colors, while the eyes are white and the mouths bright red. The support used for hanging the monkeys can be made of brass curtain rod, about ⅛ in. in diameter and 16 or 18 in. high, having the upper end bent at right angles for about ½ in.—H. C. McKay, Brooklyn, N. Y.

Photo of Watch with Objects Keeps Record of Exposure

When copying it is often desired to keep a record of the exposure. Instead of marking this on the negative you will find it much easier to place a watch next to the print being copied, which will show the exact length of time in seconds or minutes that the print was exposed. The arc covered by the second hand during the exposure will be blurred and thus plainly visible. This is also true of the minute hand in a longer exposure, although exposures of several minutes are seldom needed. Of course, the part of the negative showing the watch is not reprinted.—F. H. English, Springfield, Mo.

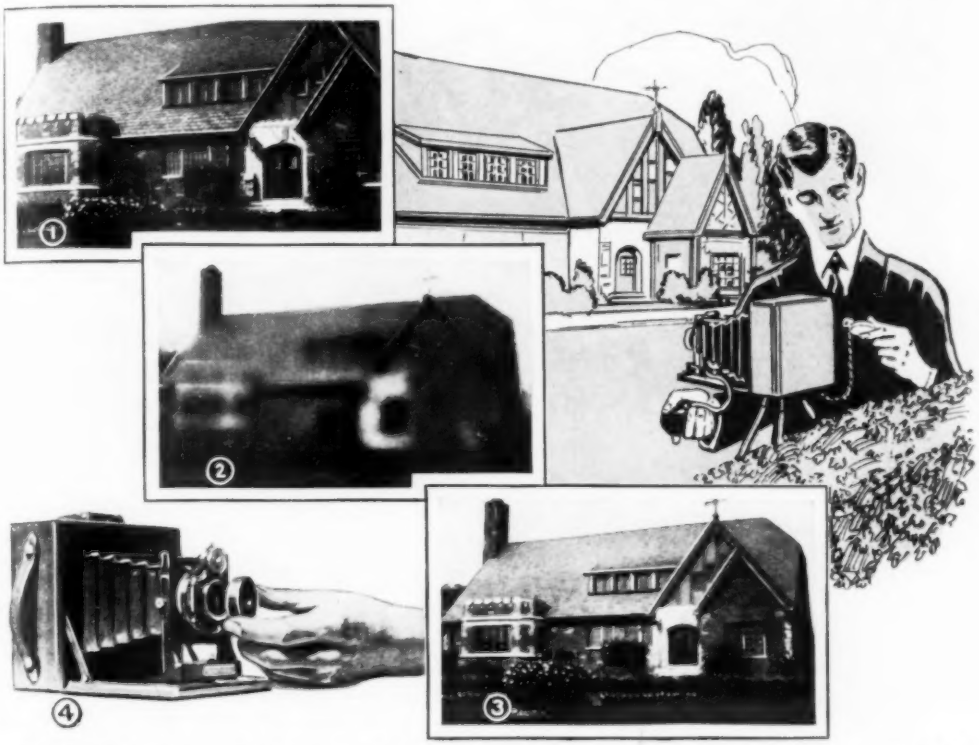
Emergency Luggage Carrier

When you need a running-board luggage carrier in a hurry and do not wish to go to the expense of purchasing one, get a 6-in. board, about 1 in. wide and as long as the running board. Cut out two corners on the same side of the board thereby reducing the width of the ends and permitting C-clamps to be used as shown in the photo. The clamps hold the board edgewise on the running board. The screw end of the clamps should, of course, project upward. It is surprising how securely a board can be clamped in this way, and if the clamps are kept tight, there will be no danger of the board coming off.—Myron L. Harmon, South Bend, Ind.



Two C-Clamps and a One-Inch Board Make a Handy Luggage Carrier for Your Car

CAMERA WITH PINHOLE CAP TAKES LARGE PHOTOS



The House in Photo 1 Could Not Be Taken in Full with the Lens at Hand; Photo 3 Shows the View Obtained with the Pinhole Cap

When it is impossible to place the camera far enough from an object to get it entirely on the film when in focus, as in Fig. 1, and the photographer has no wide-angle lens handy or does not wish to purchase one, the simple trick of using a pinhole cap over the lens will overcome the difficulty. Any snug-fitting paper cap is satisfactory. With a needle, about 1½ times as thick as an ordinary pin, punch a hole in the exact center of the cap. The object to be photographed is then focused on the ground glass until the whole of it can be seen, but very hazy as in Fig. 2. Then slip the pinhole cap over the lens, Fig. 4, and make the exposure, which will come out clear and distinct as shown in Fig. 3. When making a photo by this method, allow from 4 to 6 times the normal exposure for stop F.64 or from 8 to 12 times the normal exposure for stop F.32, etc.—K. F. Keith, Chicago.

Ashes on Clay Soil Grow Sweet Potatoes

For raising sweet potatoes, black soil and clay soil were found entirely unsuited by a small truck farmer, after he had tried for several seasons. It happened that some sweet potatoes were thrown away at the base of an ash pile and these, receiving no cultivation whatever, produced a surprising yield. The farmer analyzed the soil and found it to be rich in ashes, sand and loam. He duplicated this mixture as closely as possible and spread several wagon loads on a barren clay hill. Every year he now harvests large quantities of potatoes from this spot which he sells at a good profit.

¶A small match box makes an ideal container for collar buttons and may be kept on the bureau; no one cleaning will throw away a match box that rattles.

THIS DOLL HOUSE

By Hi Sibley

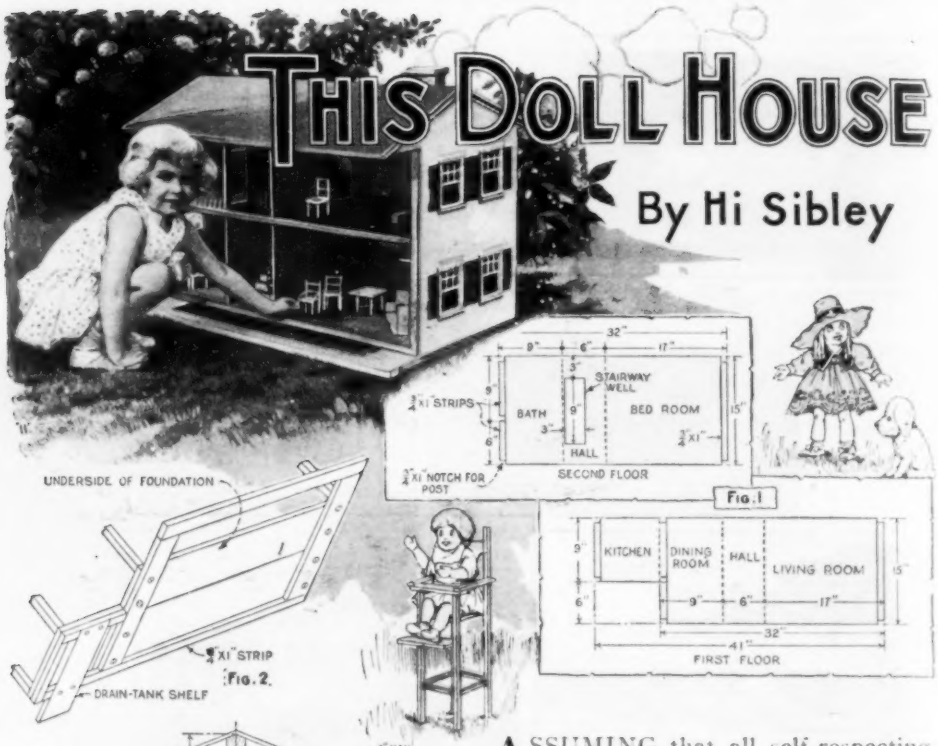


Fig. 2

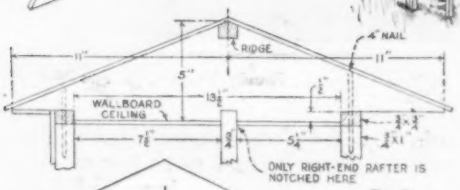


Fig. 3

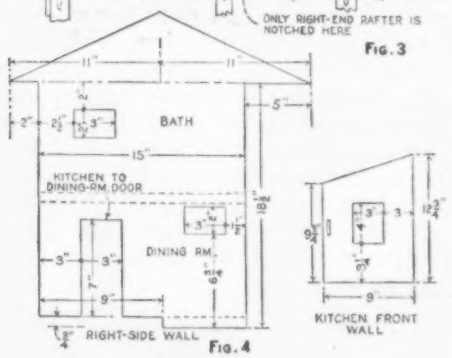


Fig. 4

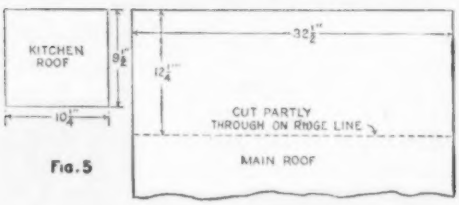


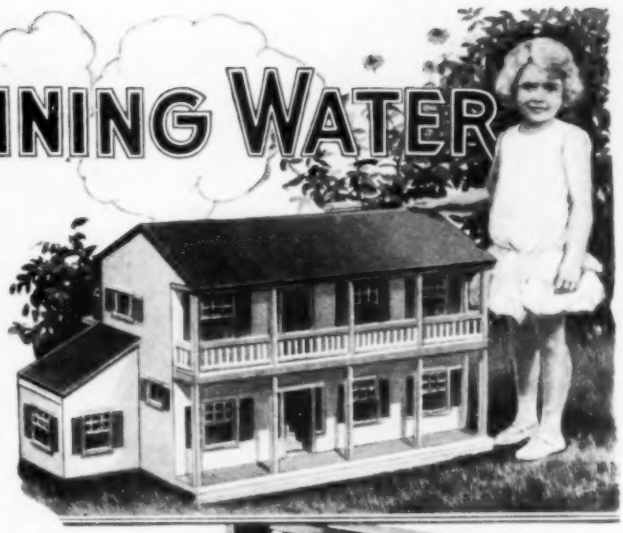
Fig. 5

ASSUMING that all self-respecting dolls appreciate a morning bath fully as much as their mothers—and probably a lot more—this very modern doll residence is equipped with running water and a built-in tub. Even the kitchen is provided with an honest-to-goodness sink and tap.

The architectural style follows the California Monterey type, a clean-cut and inviting design which is now very popular on the coast, and had its origin in the homes of the first prosperous American settlers. There are five rooms, not including upper and lower hall; a staircase, fireplace and upstairs balcony. The entire front wall, together with the verandah, is instantly removable, giving access to all the rooms.

Wallboard is used for the walls, partitions and roof, and a standard size sheet, 4 by 9 ft., will be ample for the job. Begin with the first floor, laying it out on the plan in Fig. 1. White pine, redwood or similar material is

HAS RUNNING WATER



suitable. The boards should be ¾ by 7½ in. (net) wide. Tie them together at the ends by means of ¾ by 1-in. strips as shown. This prevents splitting and the tendency to warp. The second floor is made much in the same manner, having a staircase well cut in, as located in the drawing, before the two boards are fastened together with the end strips. Notches, ¾ by 1 in., should be cut where indicated for the corner posts.

In Fig. 2 is shown how the underside or foundation is built up, with cross cleats to support the extension in front for the wide step to the verandah, and the sheet-metal shelf for the drain tank. Strips, ¾ in. square, are nailed around the edges to level up the foundation. Next install the corner posts, which are of ¾ by 1-in. section

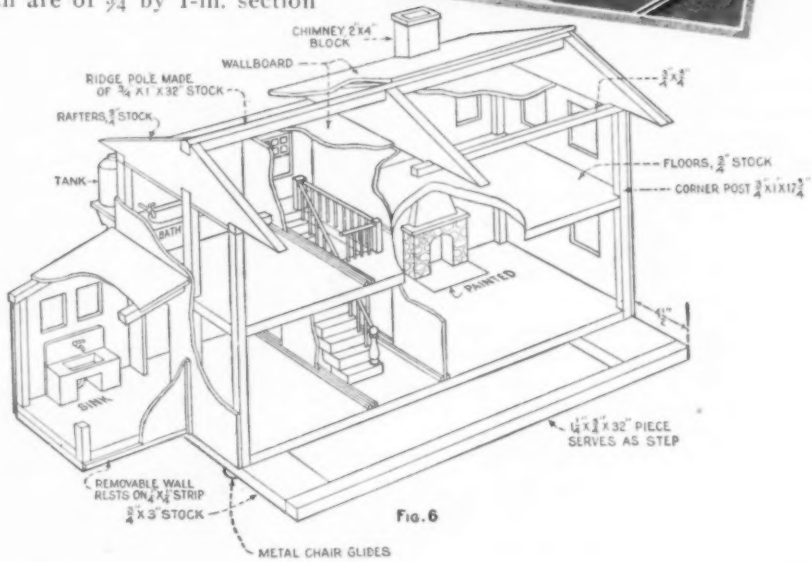


FIG. 6

(see Figs. 3 and 6). The second floor should be located so that the first-floor rooms will be just 9 in. high. Crosspieces, ¾ in. square, are laid across the tops of the front and rear pair of corner posts, and these in turn are bridged with the three gable-shaped rafters. In Fig. 3 is shown how to cut these rafters. They are secured to the corner posts with 4-in. nails driven down through them, but holes should first be drilled to prevent the wood from splitting.

White pine or redwood is first-rate material for the entire framework with the exception of the corner posts and the pieces across their tops, which should be of stronger wood. Construction of the kitchen framework is clearly shown in the cut-away perspective drawing, Fig. 6.

Now square up the framework and hold it thus with temporary diagonal braces, and start on the walls. Figs. 4, 11 and 13 give dimensions of these, including windows and doors. If your framework is accurately made, you can lay out the walls, etc., from the drawings, but in case of any slight variation, it is well to hold the wallboard against the sides of the frame and mark around it.

Cut the rear wall first. Lay the wallboard flat on a level surface, with a clean board, or, better, a piece of scrap wallboard under the line you are about to cut. This prevents dulling the point of your knife and also insures a clean cut. Use, if possible, a knife with a thin, pointed blade and large enough handle to afford a good grip. The first cut should be fairly light, just enough to go through the surface without tearing it. Two or three more cuts should complete the incision. Above all things, keep the knife sharp. Make clean cuts particularly in the corners of window and door openings.

Having completed the rear wall, tack it to the framework temporarily, and make the end walls next, with allowance on the back edges to lap over

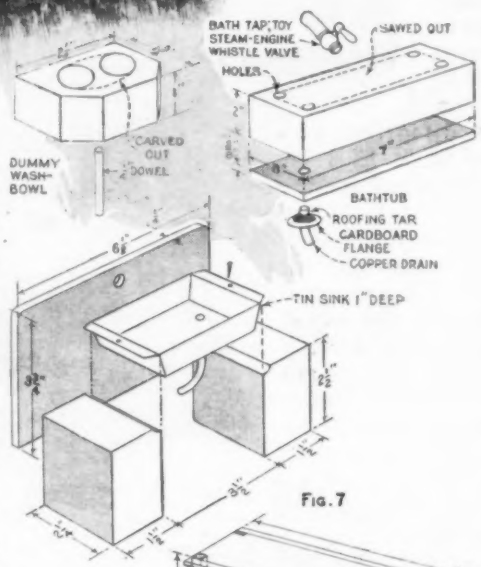


FIG. 7

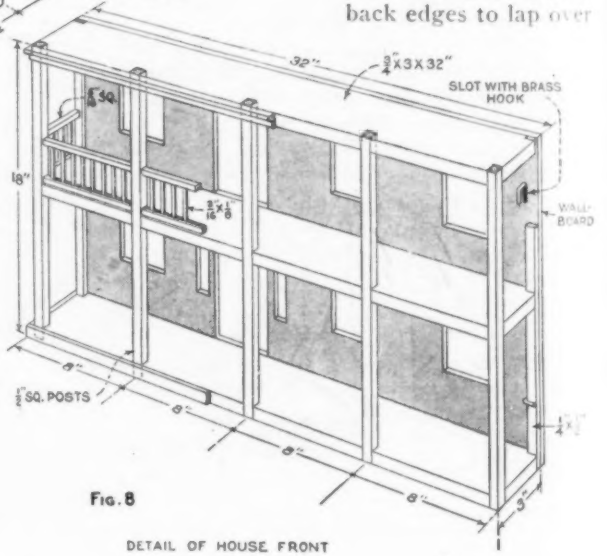
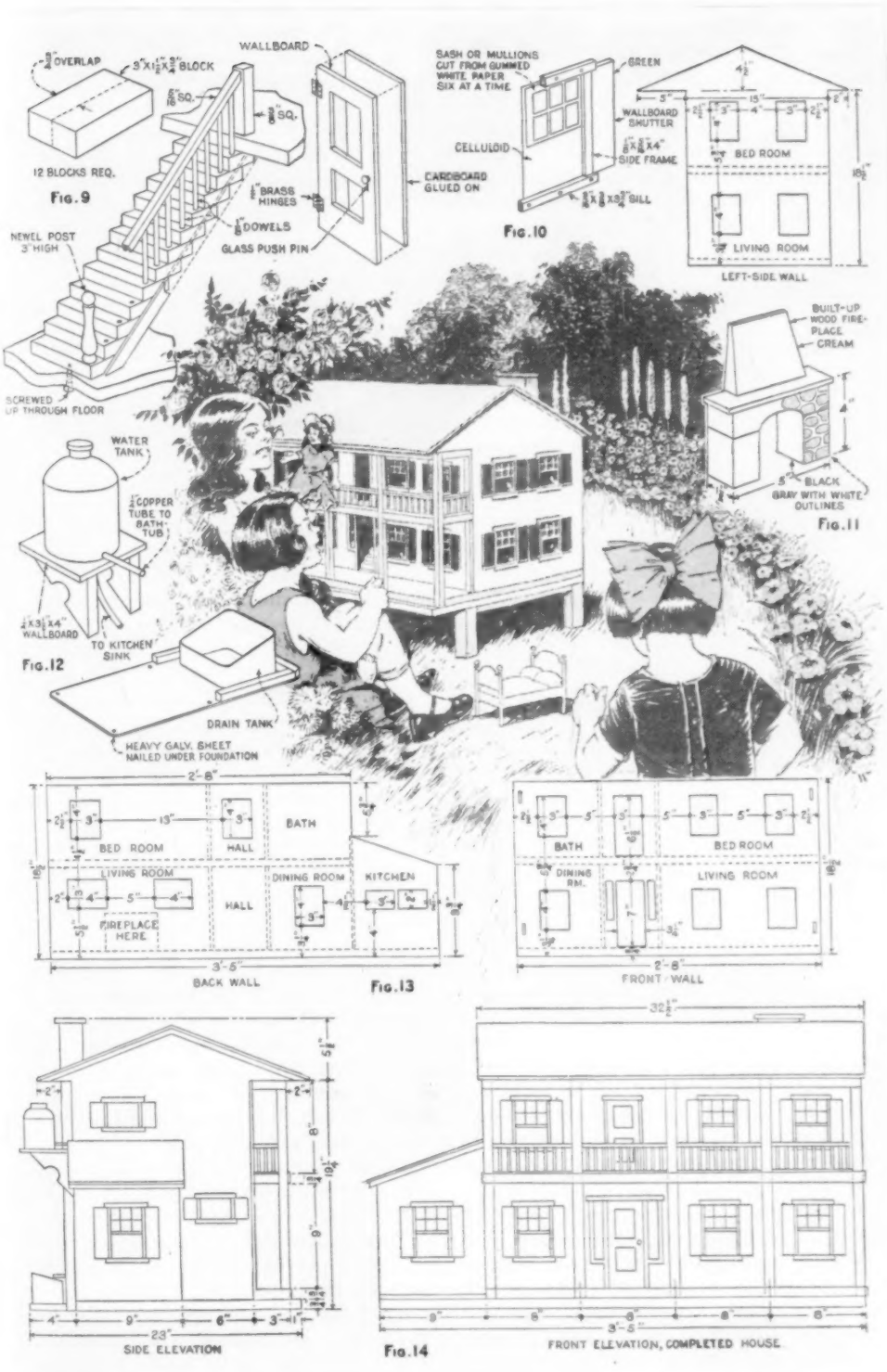


FIG. 8

DETAIL OF HOUSE FRONT


WALLBOARD
OVERLAP
3"X1½"X¾" BLOCK
⅛" SQ.
⅜" SQ.
12 BLOCKS REQ.
Fig. 9
¼" BRASS HINGES
⅛" DOWELS
GLASS PUSH PIN
CARDBOARD GLUED ON
NEWEL POST 3' HIGH
SCREWED UP THROUGH FLOOR
SASH OR MULLIONS CUT FROM GUMMED WHITE PAPER SIX AT A TIME
GREEN
CELLULOID
WALLBOARD SHUTTER
⅛"X⅜"X4" SIDE FRAME
⅛"X⅜"X3¾" SILL
Fig. 10
BED ROOM
LIVING ROOM
LEFT-SIDE WALL
BUILT-UP WOOD FIRE-PLACE CREAM
BLACK GRAY WITH WHITE OUTLINES
Fig. 11
WATER TANK
¼" COPPER TUBE TO BATH-TUB
¼"X3½"X4" WALLBOARD
TO KITCHEN SINK
Fig. 12
DRAIN TANK
HEAVY GALV. SHEET NAILED UNDER FOUNDATION
BED ROOM
HALL
BATH
LIVING ROOM
FIREPLACE HERE
HALL
DINING ROOM
KITCHEN
BACK WALL
Fig. 13
BATH
BED ROOM
DINING RM.
LIVING ROOM
FRONT WALL
SIDE ELEVATION
FRONT ELEVATION, COMPLETED HOUSE
Fig. 14

the edges of the rear wall, so that the joint will make a square corner without a gap. The front edges of the end walls should be flush with the front corner posts. Continue with the kitchen walls and front wall. The edges of the latter should come flush with the end walls.

Now give all walls two coats of paint, a white gloss exterior paint being suitable. Allow plenty of time for the first coat to dry before applying the second. When that, in turn, is dry, build up the window frames, Fig. 10. Celluloid is used instead of glass. Note that nearly all the windows are 3 by 4 in.; the celluloid should be cut ¼ in. larger all around, making it 3½ by 4½ in. For the upper sash, or mullions, use white gummed paper. Fasten about six sheets, gummed side down, on a smooth board, with sash outlines drawn on the top sheet and cut away the openings with a sharp knife. Then moisten the surface of the celluloid with a damp cloth and lay the gummed frames over it, pressing down through a sheet of dry paper.

Doors are easily made of wallboard, the panel effect achieved by cutting out openings and gluing a piece of pasteboard the size of the door on the back side (Fig. 6). Clamp them in a vise, or place under a flat weight while drying, so they will not warp. Although the balcony door opens to the inside, the main door swings out as the stairway does not permit its opening all the way in, and it is not feasible to set the stairway farther back.

Give the doors an application of walnut or mahogany oil stain, wipe away the surplus, and when dry, apply two coats of shellac or varnish. The first and second floors should also be given two coats, with the exception of kitchen and bathroom. For the former an appropriate pattern of oilcloth serves as linoleum, and in the bathroom a small check design to resemble a tile floor, as shown in the photo, may be laid.

The stairway is surprisingly easy to construct, as shown in Fig. 9. Note that the under edge, when assembled, is rabbeted to receive a finishing strip, which adds much to the appearance. The rail around the stair well on the second floor is made up in a similar manner.

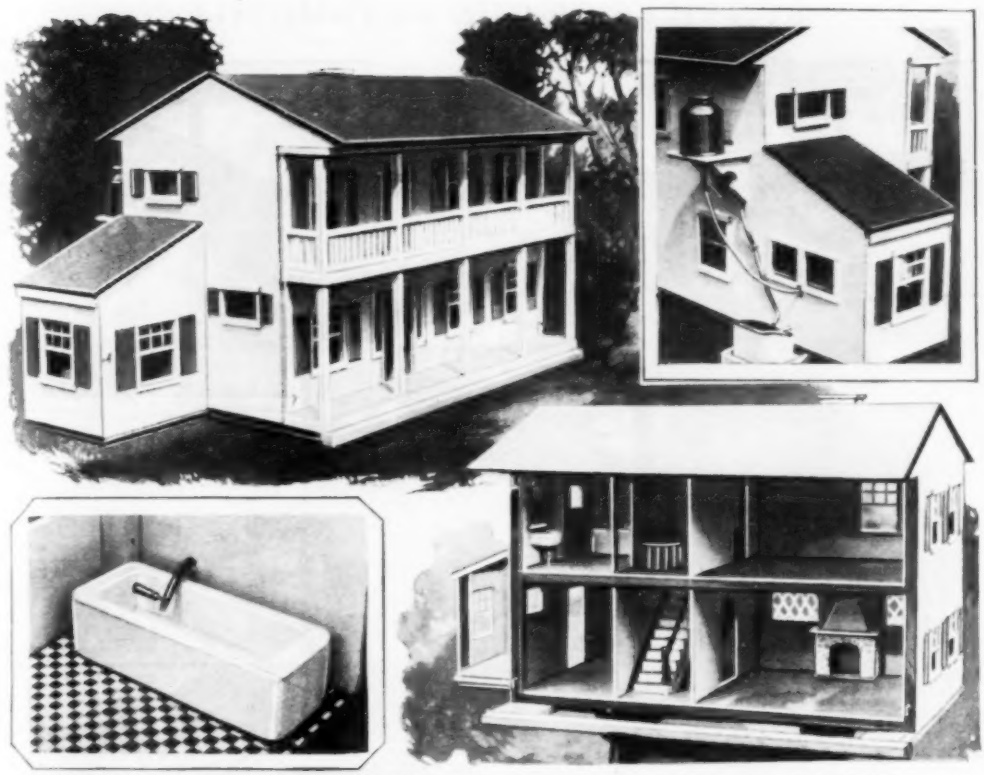
Before assembling, complete the paint job. The treads should be stained walnut or mahogany, with the risers in white, as are also the spindles and sides of the steps. Newel post and handrail should be finished like the stair treads.

The fireplace is made up of wood blocks, assembled as shown in Fig. 11 and finished to resemble stonework below the shelf. This is accomplished by giving it two or three coats of gray lacquer, and, when dry, outlining the joints in white. The inside is painted black, and a hearth is painted on the floor in either gray or brick-red.

The plumbing equipment is very easily made. For the built-in tub use a block of white pine, drilled and cut as shown in Fig. 7. Finishing is done with rasp and sandpaper, and the corners and edges are nicely rounded, as shown in the photo. A ⅜-in. piece is nailed to the bottom, and the joints on the inside are rounded by filling corners with a fillet of plastic wood. When dry, the tub is given several coats of white brushing lacquer, until it finally assumes the appearance of porcelain.

Quarter-inch copper tubing, such as is used for automobile gas lines, is satisfactory for both feed and drain pipes. A very little care assures a watertight joint in the drain. Locate the tub in position on the bathroom floor and mark where the drain pipe is to go through the wood. Bore this hole, as well as one in the dining room wall below where the pipe leads outside to the drain tank. Bend the pipe into shape for installation and, having carefully smoothed up the tub end, set it in place, so that about ¼ in. extends up through the bathroom floor. Make a pasteboard flange to fit snugly around the end of the pipe, push it down to the floor and spread on a small quantity of roofing tar, taking care not to get any inside the pipe. The tub is then forced down on to the drain pipe, the pasteboard flange squeezes the tar up into the joint, and there you are—a neat, absolutely watertight joint.

The washbowl is merely a dummy, whittled out of white pine and carefully sandpapered as shown. It is given several coats of white lacquer, and the dummy drain pipe is finished in aluminum paint. The bowl is set up in the bathroom with a



Top, Left, Kitchen End of House; Right, View of the Rear, Showing the Oilcan Supply Tank Mounted on Its Shelf, with Pipes to Bath and Kitchen, and Drain to Tank; Below, Left, Detail of Bath, Showing Faucet; Right, Interior View of House

narrow shelf above, topped with a mirror.

A sink is cut from a single piece of tin, with the edges bent up and soldered, as in Fig. 7. A piece of copper tubing is soldered in for the waste pipe, which leads through the wall to the drain tank outside. Note that the wood blocks are slightly grooved to receive the flanges of the tin sink, and the joint is smoothed over with plastic wood. White brushing lacquer is used to cover this job also.

For the supply tank, Fig. 12, a bright new copper oilcan, of the type shown, makes neat-appearing equipment. Such cans may be had at ten-cent stores in about half-pint size. They are not really all copper, so it will be necessary to paint the inside to prevent rust.

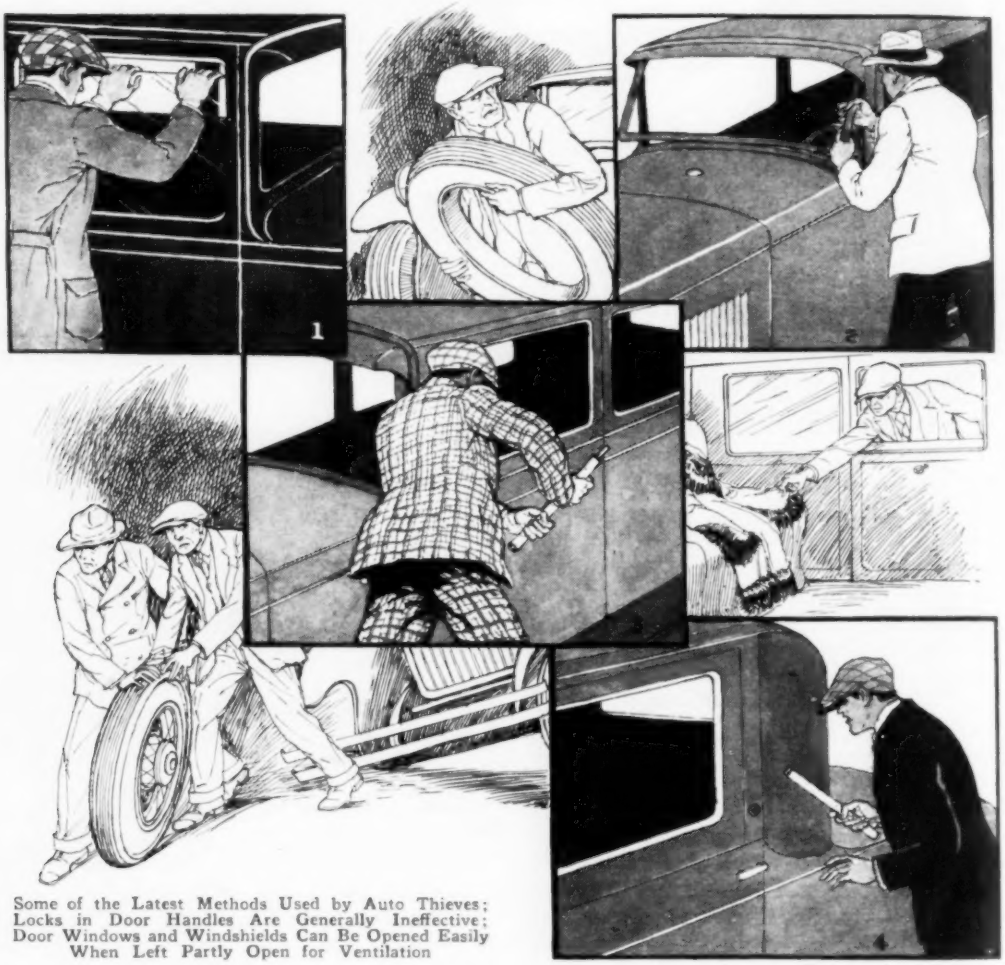
The faucets are toy steam-engine whistle valves. Solder them into the ends of the supply pipes, and make the shelf to support the tank on the outside of the bathroom. A drain tank can be made of a tin can cut off at an angle, the higher side on the back to serve as a splash guard when the tub is running through a heavy assignment on Saturday night.

With everything installed, complete the front of the house, which is built in a separate unit to be removable (Fig. 8). Porch, balcony floor and ceiling of the latter are all cut to the same pattern, ¾ by 3 by 32 in., with notches for the five square columns on the front side and the two pilasters at the corners of the wall.

In assembling the verandah, it is assumed, of course, that all the window and door frames are already installed on the front wall of the house, since it is not an easy matter to put them on after the verandah work is completed. Note, in Fig. 8, how the front side of the house is held in place with brass L-hooks passing through slots in the wallboard. A quarter turn holds the wall securely.

Before nailing down the wallboard roof, fasten on the chimney with nails or screws on the underside. The latter has a molding around the top, the inside area being painted black.

LATEST TRICKS OF THE AUTOMOBILE THIEF



Some of the Latest Methods Used by Auto Thieves; Locks in Door Handles Are Generally Ineffective; Door Windows and Windshields Can Be Opened Easily When Left Partly Open for Ventilation

Few people realize the ease with which an adept thief can gain entry into an apparently securely locked car. Millions of dollars in plunder is the yearly toll of the auto sneakthief, who makes a practice of walking along a dimly lighted street in the early evening and during the dinner hour. Carrying a flashlight, he throws a beam into the parked cars he passes. If the flash reveals anything of value left on the seat or floor, he generally finds a way to gain access to the loot, unless a few simple precautions are taken.

It is a habit with many car owners, when parking their cars, to leave a window down about ½ in. or more for ventilation purposes. Such a car is easy prey for the robber. Mr. Thief has lately found that by inserting his fingers into the opening, as shown in Fig. 1, and gently shaking the window, the glass will slide down slowly, which it will not do under a direct and steady pull. Then again, on some of the popular-priced cars having windshields that open outward, owners frequently leave the windshield slightly open, feeling sure that it is held securely by the thumbnuts. A clever car thief grasps the glass as shown in Fig. 2 and, by shaking each end alternately, can soon loosen the thumbscrews, no matter how snugly they have been tightened. It is then a simple act to reach inside and open the door. To foil such methods of entry through the windows, be sure to see that they are all tightly closed. However, even with these

precautions, there are many tools that will quickly open the ordinary car-door lock. One of the simplest of these is a piece of gas pipe, which, when applied as shown in Fig. 3, will noiselessly break almost any car lock that is incorporated in the door handle. The best protection against such an occurrence, however, is to install a good cylinder lock of the better grade in the door itself, as shown in Fig. 4. With such a lock, few thieves will tackle the car as they would have to break the glass and thus attract undesired attention.

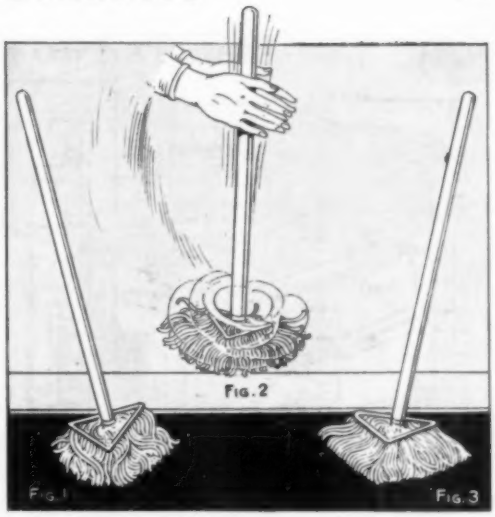
Another device used by the professional car thief, and one recently developed to perfection, according to a large Chicago lock-testing laboratory, is a "hootenanny," so-called by the criminals using it. This is said to render ineffectual even the armored-cable, grounded-distributor type of lock, formerly considered impregnable. Although this device has proved quite a boon to the thief, the manufacturers have developed a lock for distributor caps which renders cars theft-proof against even the hootenanny operator.

A favorite racket for the small thief is the acquisition of wheels and tires, which he collects along dimly lighted streets. It takes only a few moments for a couple of quick wheel thieves to remove the lugs and slip off the wheel, letting the axle fall on the ground, much to the embarrassment of the owner or driver when he returns. This kind of loss can be prevented by equipping each wheel with a special rim lug fitted with a key-operated lock similar to a spare-tire lock, which prevents the lug from being loosened.

To prevent the loss of valuables from your car, the best advice is to remove articles that you do not wish to lose. Then, as a further step, insure with a reputable company.

Old Magazine Holds Rubbers While Cleaning Them

Rubbers are hard to hold when scraping mud and dirt from them. The task is made much easier by rolling up an old magazine and putting it inside of the rubber from toe to heel to serve as a handle. This will prevent the rubber from yielding under pressure.



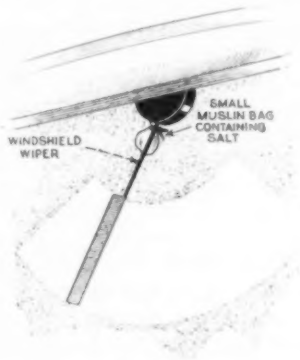
Tangled Strands of Mops and Dusters Can Be Spread Out by Twisting the Handle between the Hands

Spinning Mop Disentangles Strands

Strands of floor mops, polishers and dusters frequently stick together and form a tangled mass. To untangle it, lift the mop a few inches off the floor and spin the handle between the palms of your hands. This creates a centrifugal force that throws the strands into a flat fanlike arrangement. While the mop is still spinning drop it to the floor. It will then spread out covering a maximum area, and will stay flat until lifted again.

Salt Keeps Windshield Clear of Sleet

In Wisconsin a number of bus drivers are employing a simple but effective method of preventing accumulation of ice on the windshield during sleet storms. A small muslin bag containing salt is attached to the upper part of the windshield wiper. The moisture dissolves the salt gradually, the water runs down, is caught by the wiper and spreads evenly over the glass.



Tier of Racks, Attached to the Inside of a Closet Door, Makes a Convenient Place for Keeping Magazines

Magazine Rack Is Attached to Closet Door

Attached to the inside of a closet door, the tier of racks shown in the illustration provides a convenient storage place for magazines at home or in the office. The bin at the bottom is intended for office use, but two more racks may be built instead. Three-ply veneer, ⅜ in. thick, is used for the back, front and bottom. The ends are cut from 1-in. white pine, 6 in. wide, making the top and bottom square with the back and running the width from 2¼ in. at the bottom to 3½ in. at the top. All other dimensions are given in the details. If carefully sawed, only the upper edges of the ends need sanding. Each rack is screwed to a piece of plywood, which in turn is screwed to the door. If a bin is made, it should be hinged at the bottom as indicated, and a turnbutton provided at the top to hold it in place. It is a good idea to drive the nails at various angles, in order to obtain a dovetailing effect. Four-penny finishing nails are used for fastening the sides and bottom to the endpieces.—Edwin M. Love, Alhambra, Calif.

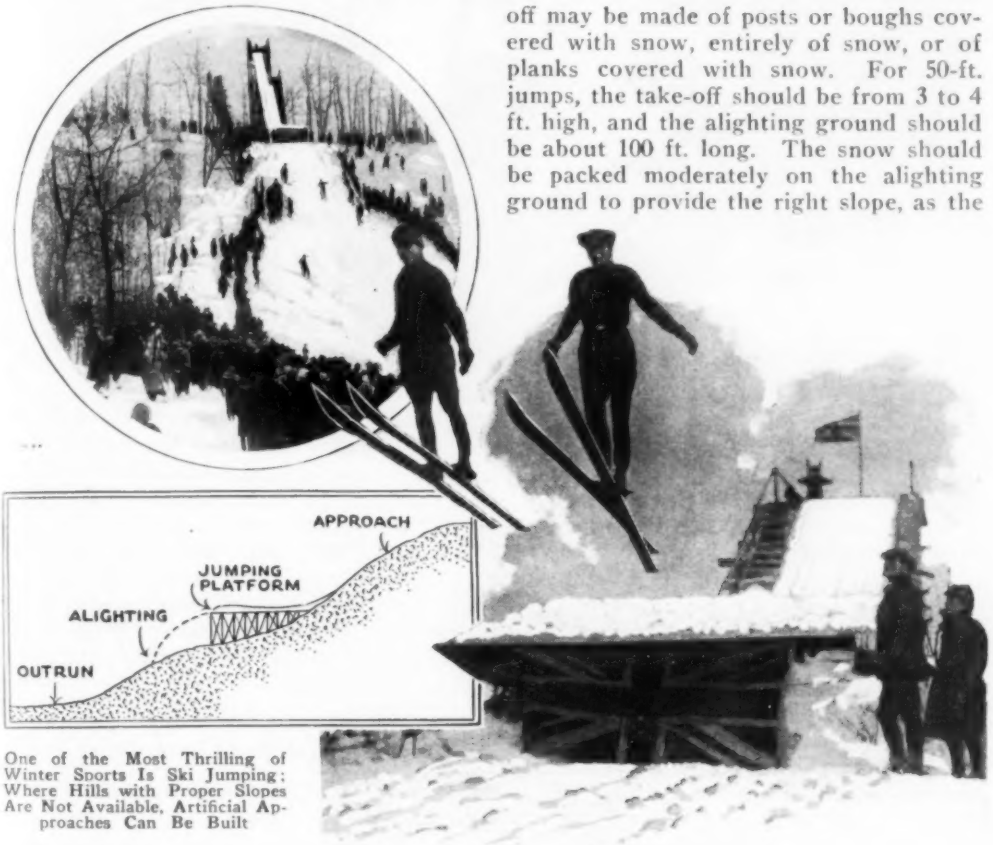
Focusing Cloth White on One Side Is Cool

People do not wear black clothing in the tropics. Any photographer who has worked outdoors during hot weather with his head under a black focusing cloth knows the reason. Black cloth absorbs the heat, and he soon feels the intense temperature. On the other hand, white cloth reflects heat as well as light, and for this reason one side of a focusing cloth was covered with heavy white muslin, both cloths being sewed together along the edges. In use, the white covering was kept on the outside and it was then found that the absorption of heat was greatly reduced. When the focusing cloth becomes soiled it can be sent to the laundry. In making some tests with a thermometer, it was found that the difference in temperature under a white and a black cloth, when used in the sun, was from 15 to 20° F., depending, of course, on the outside temperature.

"Holster" for Pipes Prevents Breaking Them

A piece of auto-top covering, slit so that it can be hung from a belt and to receive the stem of a pipe, makes a convenient holster that prevents your pipe from being broken. The best position for the holster is at the side, as shown in the drawing.—Wm. P. Coleman, Grand Rapids, Mich.

HOW TO BUILD A SUCCESSFUL AND SAFE SKI JUMP



One of the Most Thrilling of Winter Sports Is Ski Jumping; Where Hills with Proper Slopes Are Not Available, Artificial Approaches Can Be Built

To fly through the air on a pair of wooden wings is one of the most thrilling of winter pastimes, and it is comparatively easy to make a ski jump, provided the contour of the land is suitable. The ideal ski-jumping course consists of an approach, a take-off or jumping platform, the alighting ground and the out-run. If possible, select a north or northeast slope. A southern slope is not desirable. The detail shows the proper contour of the land to make an ideal ski run. A slope of about 30° is best. Where insufficient slope prohibits the proper angle, an approach of timber may be built as shown in the photos. The take-off should be level or sloping gently downhill, and the angle should be a gradual one. The alighting ground should have the same angle as the approach. Measure this accurately, as it is very important in making successful jumps and safe ones. The take-off may be made of posts or boughs covered with snow, entirely of snow, or of planks covered with snow. For 50-ft. jumps, the take-off should be from 3 to 4 ft. high, and the alighting ground should be about 100 ft. long. The snow should be packed moderately on the alighting ground to provide the right slope, as the jumper should never land on level ground. It is essential that he land on the steep slope for safety, so that he may keep on going until the momentum gained is gradually lost as the slope flattens out in the out-run. The ideal alighting ground at the foot of the hill should gradually grow less steep until it merges into a safe level out-run where the jumper is able to swing or stop. No logs, stumps or other debris should remain here, as they might cause disaster.—Earle W. Gage, Ashville, N. Y.

Doorknob Rids Poultry House of Snake

An old white doorknob was found effective by a Texas poultry farmer to rid a house of a snake that had been robbing the nests. All the eggs were removed from one nest and the doorknob substituted. In due time the snake came and swallowed the knob—good night, snake!

In the Construction of This Bobsled, Pipe and Pipe Fittings Were Found Highly Suitable

Pipe Makes Rigid Frame for Bobsled

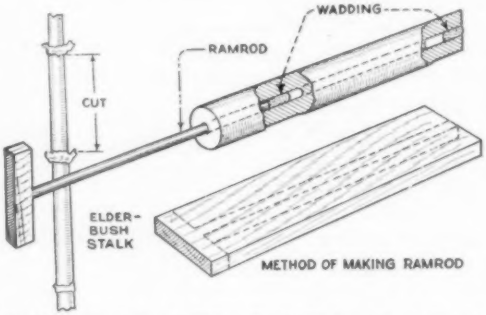
Here is a sled that is easy to make, as pipe and pipe fittings are used in its construction. The pipe offers greater strength and rigidity than a wooden frame and this feature is surely needed to withstand the hard usage the boys give it. The following parts are needed: Three ¾-in. nipples, 4¾ in. long; five ¾-in. nipples, 2 in. long; three ¾-in. tees; seven ¾-in. pipe flanges; 26 round-head bolts, ¼ by 1½-in.; one hardwood board, 10¾ by ¾ by 5 or 6 ft.; two pieces 1 by 2 by 19-in. hardwood for footrests; four pieces hardwood, 1 by 3 by 19 in., for runners; 8 ft. of runner iron, and a sufficient number of 1-in. wood screws to fasten the runner iron to the runners. The flanges are screwed to the underside of the board and also to the sides of the runners. One at the front serves as a pivot on which the front runners turn for steering. Cleats screwed to the board provide suitable footrests.

Sponge in Wide-Neck Bottle to Hold Water Color

Those who use water colors for art work will find the following idea a useful one. Get a number of wide-neck bottles, 2 or 3 in. high, and cut a piece of sponge to fit in each. Soak each sponge with water and work in enough color so that, when a brush is drawn over the sponge, it will absorb some of the color. The amount will be sufficient for working without the risk of dripping. Each bottle is labeled according to the color it holds. Stoppers are used when the bottles are not in use, to prevent the sponges from drying out. In this way color is always available and it will not be spilled when the bottle is accidentally upset.

Popgun Barrel Made from Elder Stalk

Barrels for homemade popguns can be made from branches of elder bush. A straight section is cut off between two joints as indicated in the detail. The bark is peeled off and a stiff wire is forced through the pithy center, the wire being worked sideways until the core is removed. A ramrod, fitted with a handle, is whittled down to fit the chamber, but should be about ½ in. shorter. The gun is then ready to be loaded. Pieces of wet newspaper are pressed into the larger end of the chamber and pushed to the other end with the ramrod. The wad will be forced out of the gun with a loud "pop," if the ramrod fits snugly and is moved quickly. W. J. Nelson, Los Angeles, Calif.



Straight Branch of Elder Bush Makes Good Barrel for Popgun

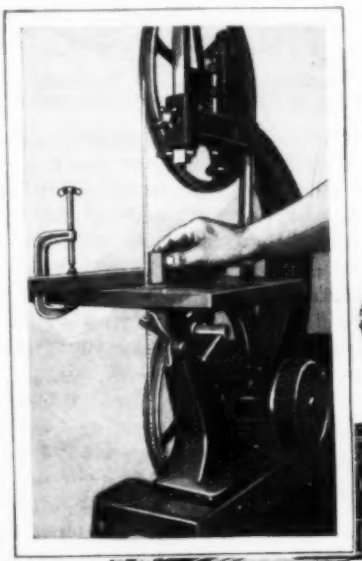
SHOP NOTES

How to Sharpen Bandsaw Blades

By W. CLYDE LAMMEY

RECONDITIONING a bandsaw blade is a much more tricky job than is the case with a circular-saw blade, but with the aid of a few simple devices, it is possible to do a first-class job in the small workshop.

Jointing and setting are important operations, and, unless the teeth of a blade are badly damaged, the former should be done first. Remove the blade from the wheels, taking pains to prevent it from kinking. Turn it so that the teeth run backward, remove the upper and lower guides and slide the upper guide support up out of the way. Clamp a strip of hardwood, ¾ in. thick, to the table top so that the edge of the strip bears against the back of the blade. Draw the blade a little tighter than usual on the wheels, and start the motor. If the blade shows a tendency to run off the wheels, adjust the upper one until the blade runs on the center of the tread. With the saw running at its regular speed, hold the coarse side of an ordinary carborundum stone lightly against the points of the teeth as shown in the photo. Hold the stone firmly on the table after it has come in contact with the teeth and do not allow it to shift after it touches the teeth lightly. When you find that every tooth has been touched by the stone, the jointing is completed; otherwise



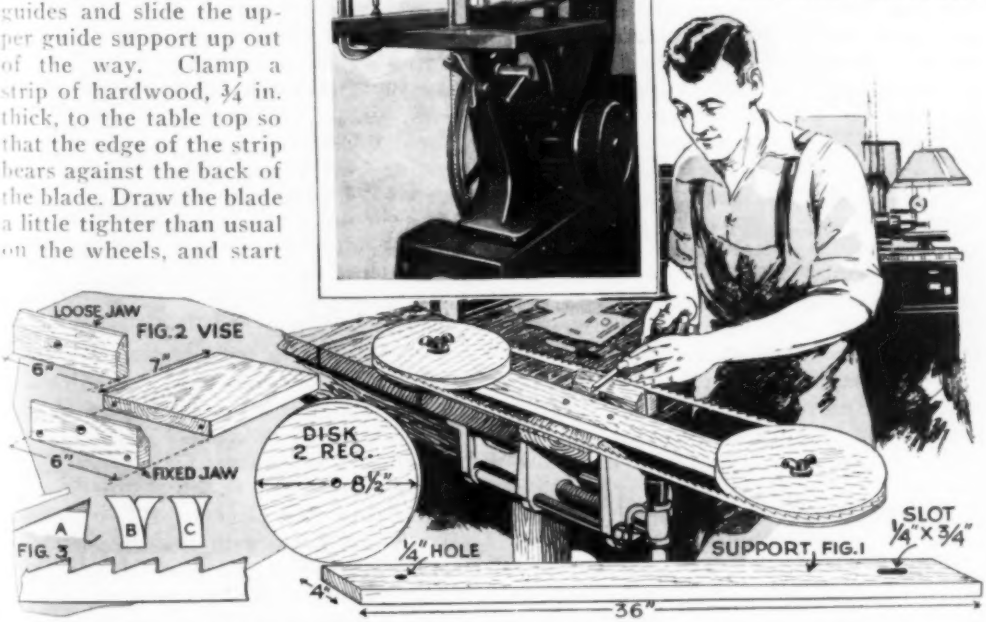
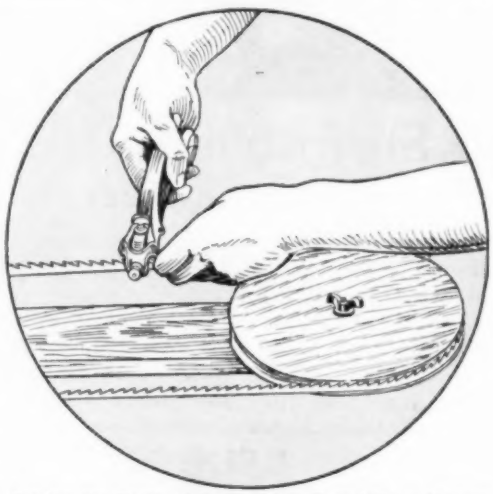


Photo Shows How a Carborundum Stone Is Used to Joint the Teeth of a Bandsaw; the Blade-Holding Jig Below Is Handy for Setting and Filing

the operation should be continued. Take care, however, not to take off more than is absolutely necessary, for on blades ¼ in. and less in width, the gullets must then be filed down to such an extent that the blade will be materially weakened and is apt to break under the strain of sawing.

A good hand sawset, which can be adjusted to set the teeth accurately, is obtained. Fig. 1 shows an arrangement made for holding the blade. From ¾-in. stock, turn two disks about 8 or 9 in. in diameter. Crown the faces slightly as on a pulley, and drill a ¼-in. hole in the center of each. Get a piece of 1¼-in. stock, 4 in. wide and of such length that, when the disks are mounted at its ends, they will hold the saw blade taut. The disks are held in place by means of bolts and wingnuts, the support being slotted at one end to permit movement of the disk for tightening the blade. This saw-blade holder is then attached to an improvised vise, which in turn can be held in the workbench vise as shown in the illustration. The saw-blade vise, shown in Fig. 2, holds a portion of the blade rigid while it is being set or filed. It consists of three parts, which are made of maple, namely: a fixed and a loose jaw, and a wooden base which holds these jaws. The fixed jaw is screwed to the base, and then the disk-support arm is also screwed onto it, so that the saw blade will come up against the fixed jaw. Set the loose jaw in place against the fixed jaw and drill a 5/16-in. hole through both at the center. Tighten the jaws together with a ¼-in. bolt, washer and wingnut. With this vise, it is an easy matter to set and file any saw blade. Adjust the saw set so that it bends less than half of the tooth, as indicated at detail A, Fig. 3.



Setting the Teeth of a Bandsaw, Especially a Narrow One, Must Be Done with Extreme Care and Accuracy

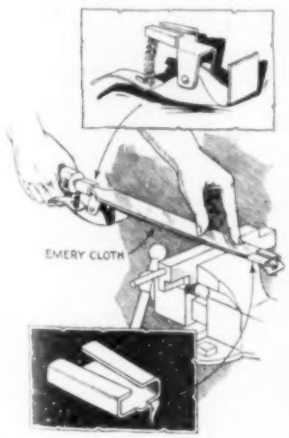
A coarse set on the teeth will make the blade cut very fast, and it will then turn curves of very short radius, but the edges of the cut will be rough. If you do fine sawing with a narrow blade, and the nature of the work requires that the blade turn short-radius curves, give the blade a coarse set. Usually a coarse set will be found best for average conditions. Uniformity in setting the teeth is important. When a hand set is used, the adjustment must be checked several times to insure accuracy of width. A "valley" between the alternate teeth, as shown at detail B, Fig. 3, must be carefully avoided, as this will cause the blade to draw sideways in the cut and will lessen the cutting speed. The correct average set is shown at detail C, Fig. 3. Leave the saw vise loose enough so that the blade will move when the disks are turned. Begin setting the teeth at any point, and after two or three alternate teeth have been set, tie a short piece of thread at the starting point. The set must be accurately located on the tooth before using it, or it may slip and pinch off the point of the tooth. Also, remember to move to the second tooth each time in order to avoid bending two adjacent teeth in the same direction. Continue the setting operation until the alternate teeth have all been bent one way. Then set all the untouched teeth in the opposite direction, using the same pressure.

After the setting has been done, get a stiff bristle brush and clean the teeth of accumulated sawdust and dirt, which will clog the file. Get a three-cornered file and be sure that it is clean. Though these precautions may seem unnecessary and are often neglected, they nevertheless contribute to a first-class job. Tighten the vise on the blade with the gullets of the teeth just above the top of the jaws. Make the file stroke straight across the blade at right angles, starting on a tooth

that is set away from you and file every second tooth. The object of filing after jointing is to bring the teeth to a sharp point, but it is of equal importance to keep the proper shape of the teeth. Teeth of a bandsaw should be filed to give them a slight uniform "rake," which causes the blade to pull into the wood when cutting. This prevents a light blade from bending back when the wood is pushed against it. The rake will be automatically formed by a three-cornered file if the file is held at the correct angle with relation to the teeth, as shown in the lower detail of Fig. 3. After the teeth bending one way have been filed, reverse the position of the blade in the vise and file the other teeth in the same way. Alternate teeth will then be filed in opposite directions. Take pains to hold the file so that the bevel of the tooth is cut uniformly to the bottom of the gullet. Never "touch up" the points of the teeth of a bandsaw, even when the width is ½ in. or more, as the shape of the teeth is certain to be altered by doing so.

Emery Cloth Held on File with Clamps

As emery cloth is often used after filing, the illustrated method of holding it on one side of the file by means of a couple of specially made clamps, will be found highly convenient. The details show the exact construction of the holders, the one near the handle comprising a spring clip, while the one at the end of the file is fitted with a sharp point that is driven through the strip of emery cloth. Both pieces are made so that they can be put on or taken off in a moment. While in place, they do not slip and hold the emery cloth securely.—Joe Chmelar, St. Louis, Mo.



Pivoted between Shelf Brackets, This Board Holds Reference Charts and Tables on Both Sides

Swinging Reference Table

In stores, shops, offices, etc., where reference tables and charts are often used, the illustrated method of mounting the charts will be found useful. Two shelf brackets are screwed to the wall, one directly above the other, as shown, leaving enough space between them to accommodate the board on which the charts are to be mounted. The board is pivoted between the brackets with screws, so that it can be turned around. Reference matter is tacked to both sides of the board and the latter turned to a position where it can be seen most readily.—Henry S. Laraby, East Haven, Conn.

Large Blotter Prevents Drafting Paper from Buckling

Changes of humidity have considerable effect on drafting paper as it absorbs the moisture, which causes it to stretch and buckle, especially when tacked to a drawing board. This trouble can easily be overcome by using large desk blotters, which are laid on the paper when the draftsman leaves for the night, suitable weights being used to hold the blotter tightly against the paper. The blotter, of course, prevents moisture from reaching the paper by absorbing it. In the case of very large drawings and tracings, two or more blotters can be stapled together.

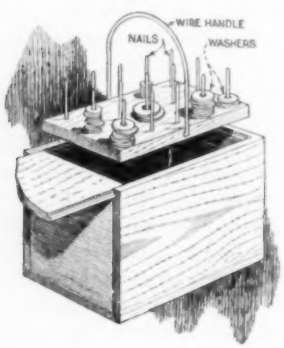
Block Prevents Splitting When End Planing

Small Block of Wood, Clamped to Piece to Be Butt-Planed, Prevents Splitting

Clamped to the edge of a piece of wood as shown in the illustration, a small wooden block will effectively prevent end wood from splitting when one uses a butt plane. This is a simple kink, but one worth remembering, as any amateur and even professional woodworker will have use for it often. Of course, it is necessary to have the top of the block cut square, and it must be set flush with the surface to be planed.—Horace Lemaster, Maryville, Missouri.

Handy Method for Storing Washers and Nuts

Washers and nuts of varying sizes may be stored in the same box and yet be kept separated by following the method indicated in the drawing. A 1-in. piece of wood, just large enough to go inside the box, is fitted with a wire handle, and a number of long finishing nails are driven through it from the underside, and spaced at equal distances for neatness. The washers and nuts are slipped over the nails and the holder is then dropped into the box. When one looks for a particular size it is then an easy matter to find it without waste of time.—Lester P. Young, Culver, Ind.

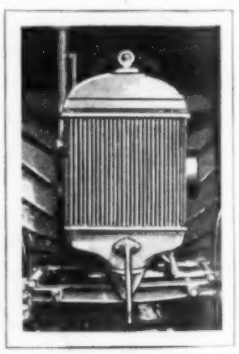


Redeveloping Dark Sepia Prints

Most photographers have had the experience of ruining prints when making sepias by having the color flash up too fast to a dark brown. The prints are then too heavy, and the highlights are all choked out. A simple method of saving the print, and also the time required to make another, is as follows: Use ordinary reducing solution on the print until it is too light. Wash it and then place it in the sepia toning solution so that it is redeveloped until the desired color is obtained. This treatment also brings out the highlights to just the right degree.—Kenneth Keith, Chicago.

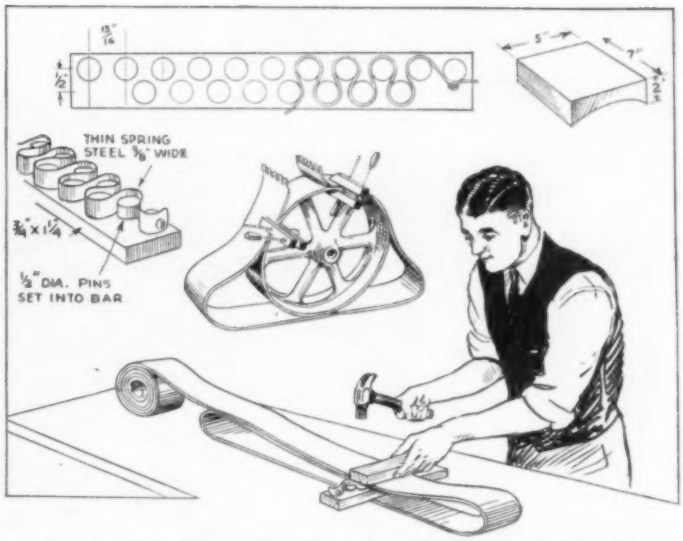
Protector for the Tractor Radiator

When field work necessitates the use of a radiator protector, a good one can be made as follows: Get two lengths of ½-in. pipe as long as the width of the radiator and drill ⅜-in. holes through one side of each pipe. The holes are spaced about ¾ in. apart and only the end holes are drilled through both sides of the pipe. Iron rods, as long as the part of the radiator to be protected, are slipped into the holes and similar rods a trifle longer than the rest are threaded at both ends and slipped through the end holes. Two nuts on the end rods, one on each side of the pipe, hold the assembly together. The method of supporting the protector in front of the radiator will vary with the make of tractor to which it is applied.



Cutter for Interlocking Sanding-Belt Ends

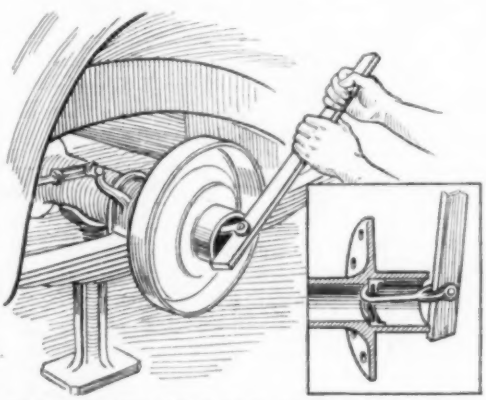
Interlocking ends, as shown in the illustration, increase the strength and consequently the life of the joint on a sanding belt. The device used to cut the ends in this way consists of a piece of spring steel, with one edge sharpened, which is threaded between two rows of staggered pins and fastened to the end pins as indicated. The pins are mounted in holes drilled in a wooden base. In use, the cutter is laid on the bench and one end of the belt is laid, sand side up, over the sharp edge of the cutter. With a hammer and a piece of soft wood, the belt is cut off. After careful measurements to determine the exact length of the belt, the other end is cut in the same way, looping the belt to make sure that the ends will be cut to match. Pry the ends of the belting from the cutter, and the belt is ready for joining. For this purpose it is handy to use a cast-iron pulley of suitable width and about 14 to 20 in. in diameter, clamping the ends of the belt to it with woodworkers' clamps as indicated in one of the details. Perfect alinement of the belt is necessary to make it run straight. The joint is backed by a piece of muslin glued to the underside. Place a piece of heavy brown wrapping paper over the pulley, and on this lay the muslin, well soaked in thin, hot glue. Quickly drop the ends of the belt in position and cover them with a block of wood, cut to conform to the curvature of the pulley. Clamp the block on over the joint of the belt and allow it to dry overnight. The belts used on the machine for which this jointer was used were 6 in. wide, but the device can be used on belts of any other width by altering dimensions to suit.—Harry R. Clausen, Chicago.



Interlocking Ends Form Good Joint on Sanding Belts; after Being Cut, the Joint Is Glued on Muslin

Tool for Pulling Grease Retainers from Axles

Many garagemen will find the illustrated tool for pulling inner grease retainers out of rear-axle housings, especially on Chevrolet and Pontiac cars, a time and labor saver. It consists of a hook pivoted at the end of a 1 by 1¼-in. flat-iron bar, 13½ in. long. The hook can be made from the end of a model-T Ford brake rod. The fitting straddles the bar nicely, and the section or rod can be bent to the shape indicated in the drawing. The center of the hook pivot should be 1½ in. from the end of the bar, while the hook itself should extend 2 in. beyond the edge of the bar.—John A. Blaker, West Auburn, Massachusetts.



This Pulling Bar Makes It an Easy Matter to Remove Grease Retainers

Log Cabin Built in Attic

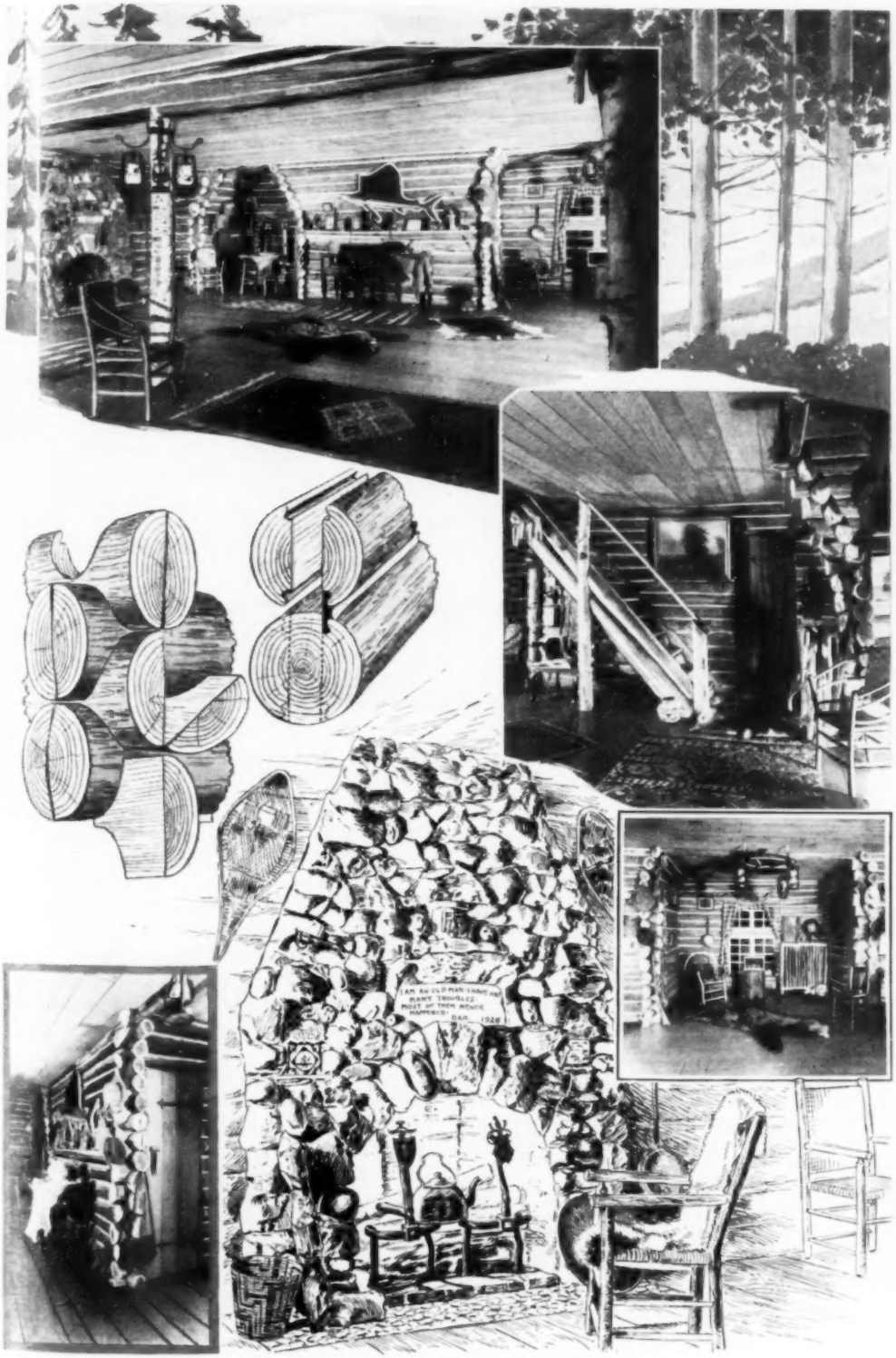
In the Center Is the Wagon-Wheel Lighting Fixture, and Just Above May Be Seen the Bunk That Covers the Vent Pipe in the Floor

WHEN Mr. Kenneth Curtis, of Winnetka, Ill., decided to build an additional room in his attic, he wanted not only something unusual, but something livable also. How well he accomplished his design is shown by the photographs accompanying this article. As soon as the attic door is closed, one is immediately transported to the north woods; even the smells are "woodsy."

The ideas embodied in this novel room can be adapted in many ways: for the attic room, like the original; for the unused room that is to be made into a "den," or for the basement that is to be transformed into a recreation room. For the sidewall "logs" Mr. Curtis used ordinary 5-in. cedar fence posts, which ran from 6 to 8 ft. long. Out of the center of each post, a 1½-in. plank was cut, as indicated in the right-hand detail on the opposite page. The planks thus obtained were used for making the doors of the "cabin," and for similar purposes, where a rough-plank effect was desired. The sections of the logs left after cutting out the plank were used as the side walls, being nailed directly to the studding, flat side to the studs. Before nailing, the edges of the logs were rabbeted as indicated, so as to form a key for the plaster chinking used to fill the spaces between logs. The half logs were joined at the corners as indicated in the left-hand detail. Thus the lowest log on a wall was notched halfway through for the next log above to fit into it; this log, in turn, was notched on its upper edge for the next log, and so on. Where the corners projected into the room, the effect of whole logs was obtained by nailing short sections to the projecting half logs, as is also shown in the detail.

As mentioned above, the chinking consisted of plaster, but this has a tendency to crack and fall out, so it is suggested that oakum or some semiplastic material, such as is used for calking around residence windows and doors, be employed instead.

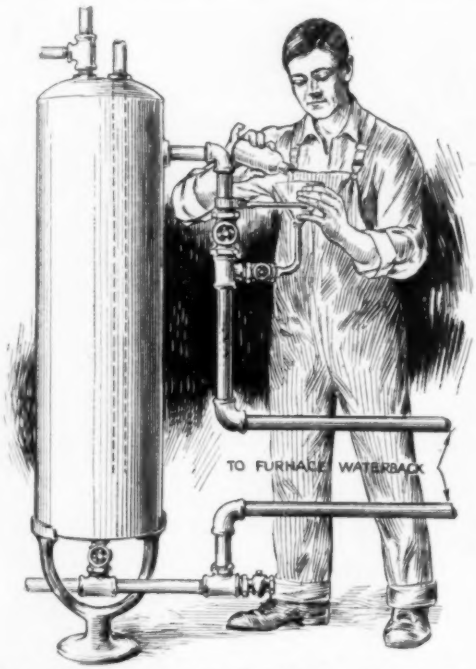
The ceiling was made of wormy cherry planks. Knotty pine, stained a deep brown, or weatherbeaten planks from an old shed also form a good ceiling. The


I AM AN OLD MAN AND HAVE MANY TROUBLES MOST OF THEM NEVER HAPPENED
DAD 1926

floor in the original room was linoleum, in random-plank pattern, but many other materials can be used. The main thing is to simulate the appearance of the floor in a real log cabin. All pillars were made of birch poles, as were the radiator covers, the table legs and the framing for the bunk seen in the heading. This bunk, incidentally, covers a vent pipe that comes through the floor in what threatened to be an awkward position.

The stairway, with its log stringers and pillars, forms an interesting note in the room, and it is suggested that it be included in any similar room, even if it does not lead anywhere. This also applies to the fireplace, built of field stone. In many places, a real fireplace may be built, but it ought to be incorporated, even if it is only an imitation.

For communication with the rest of the house, an old magneto-type telephone was installed, as more in keeping than a modern type. The main lighting fixture is shown in the head, and consists of a wagon wheel, with four old-fashioned hand lanterns wired for electric lamps, the chimneys being smoked up with a candle before installing. Many interesting lighting devices are a feature of the room, but naturally the selection of the fixtures and the method of illuminating the room are a matter of choice and availability.



This Installation Permits Cleaning Out Clogged Furnace Coil with Muriatic Acid in a Short Time

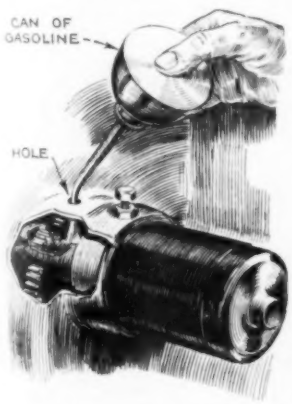
Furnace Coils Can Be Cleaned without Removing Them

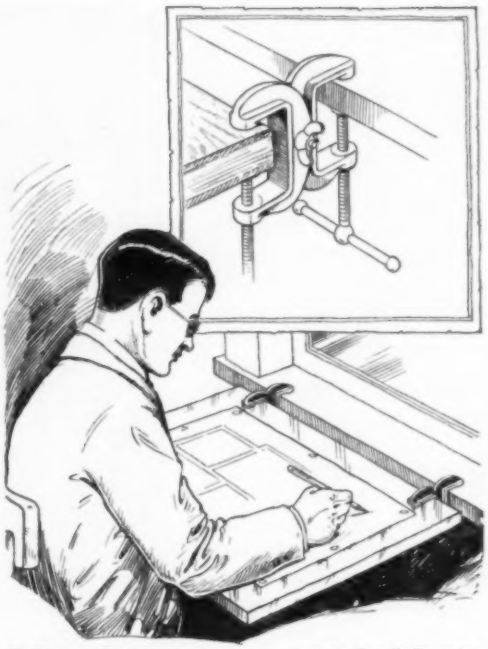
In many parts of the country the water for household use is very hard. If none of the commercial water softeners are used, the furnace coil and hot-water heater coil will "lime up" in a short time, causing inefficient operation and other trouble. When the furnace coil is thus clogged, it is often necessary to remove it for cleaning with muriatic acid, and sometimes to renew the coil. The drawing shows a simple method of eliminating the trouble. The water in the storage tank need not be drained out or disturbed except that the hot water is used for cleaning. A valve is cut in the furnace-coil circulating pipe close to the point where it enters the hot-water tank. A reducing tee is placed below this valve and a ¼-in. globe valve is screwed into the reduced end of the tee with a ¼-in. nipple. Two other nipples, connected with an elbow, are attached to the small valve, forming an intake into which the muriatic acid is to be poured. A glass funnel is slipped into the end and is supported by a suitable bracket. At the bottom entrance to the tank, a valve is installed and another one is placed at the lowest part of the system to permit draining the contents of the coil and tank. It is advisable to use gate valves for this purpose, as they do not obstruct the flow of water and will not lime up. To clean out the coil, close the valve directly under the tank and open the one used for drainage. Water from the tank will then flow out through the furnace coil and it will carry out all loose scale and sludge. The hard scale which clings to the inside of the coil must be removed with muriatic acid. The top valve in the hot-water line is closed, and the small adjacent one opened. About 2 pt. of muriatic acid is slowly poured into the funnel. Only a

small amount of acid must be poured in at a time and as soon as the acid in the funnel starts to sputter due to escaping gas, the small valve must be closed at once to prevent the acid from being thrown out. After a short time, it may be opened again and, if no more gas escapes, the rest of the acid is poured in. The small valve is then closed. As the gas cannot escape, the resulting pressure forces the acid through the furnace coil. Allow the acid to remain there for about 10 minutes, after which it must be thoroughly flushed out with water by opening the large upper valve. Leave the water run through for about 5 minutes. The coil is then ready for use again. Close the drain valve and open the one under the tank, while the top valve in the hot-water line must also be left open.

Hole in Housing Permits Cleaning the Starter-Drive Gear

On the starting motor of a car, the engaging mechanism consists mainly of a shock-absorbing spring and an unbalanced pinion. The pinion rotates on a thread, which causes it to engage the flywheel gear. Oil is not required on the parts of the starter mechanism, and the presence of oil will cause a collection of dirt, which will render the gear inoperative. It is essential to have the spring fastened at both ends. A broken or weak spring should be replaced. When the starter goes in with a slam, it is probable that the torque spring is broken and must be renewed. Usually the mechanism is under a cover or guard. If oil is thrown off the flywheel onto the gear, the latter should be washed with gasoline. A hole drilled through the housing, if the gear is inclosed as shown in the drawing, will permit washing it out as shown.





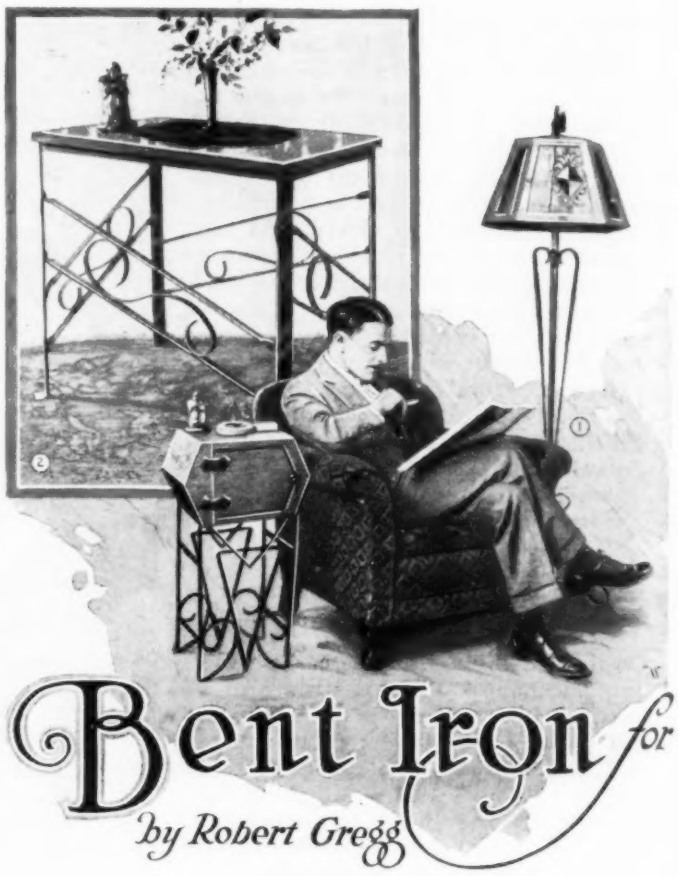
C-Clamps Enable Draftsman to Attach Small Drawing Board to Window Sill or to Edge of Table

C-Clamps Provide Convenient Holders for Drawing Board

With the aid of C-clamps securely held together in pairs as shown in the detail of the drawing, a draftsman, whose work takes him from place to place, will find it possible to attach his drawing board to a window sill or any similar ledge. The backs of each pair of clamps are drilled for a screw and wingnut, with which they are held together. This method of attachment allows a certain degree of adjustment to suit the user. When attached to furniture, insert small pieces of cardboard between it and the clamps.

New Remedy for Poultry Lice

A new and effective remedy for poultry lice is to paint the perch poles with nicotine sulphate just before the birds go to roost. The fume from this penetrates the feathers and kills the lice, but is entirely harmless to the birds. This method has been tried by experimental workers as well as practical poultrymen, and has always proved successful. Nicotine sulphate is an extract prepared from tobacco leaves and may be purchased at any drug or seed store.



Bent Iron for

by Robert Gregg

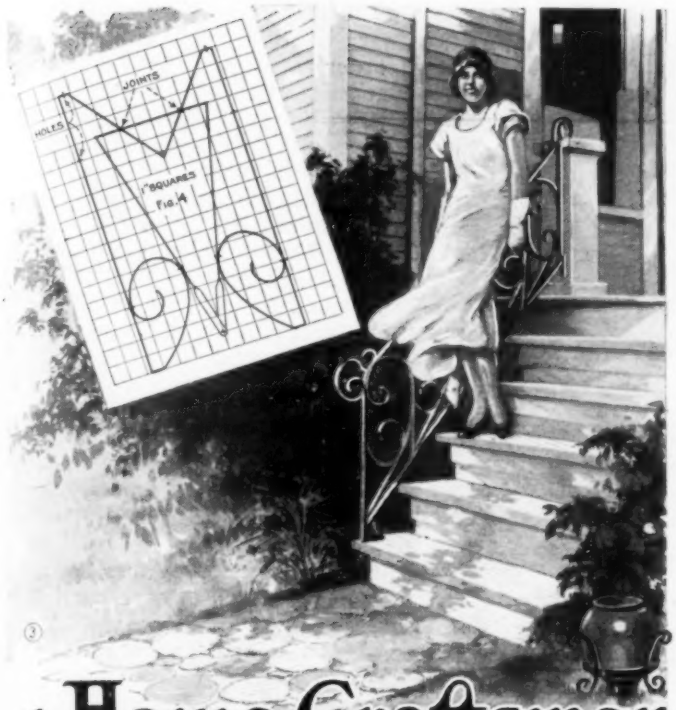
PART II

OF ALL crafts practiced by the home worker, there are very few offering the wide variety of practical projects that are possible with bent iron. Here is a medium which can be all curves or all angles; something that lends itself equally well to the making of a massive garden gate or a simple end table; an art which carries all the materials necessary for its practice in the average hardware store. Many of the simpler pieces especially, such as the humidor and lamp shown in Fig. 1, the small table pictured in Fig. 2, and the step railing shown in Fig. 3, should appeal to the home worker who appreciates projects with a "sparkle."

Taking the humidor first, this piece is constructed from 3/16 by 3/4-in. strap-iron stock throughout, and is of a style which might be labeled as more or less "French modernistic." Starting out, you will make the two ends to the size and shape indicated in Fig. 4. The outer parts of the "leg" at each end, including the curl at the bottom, are made in one piece, as may be seen in Fig. 5, while the inside triangle is fashioned from another piece. Both units are half-notched at the two points where they cross each other, the notch being cut with a hacksaw, as shown in Fig. 5, to allow the interlocking fit which is apparent from Fig. 6. The curls at the leg ends should not be fastened until the 8 1/4-in. crosspieces, shown in Fig. 7, are fitted into position, when it will be possible to fasten all three pieces with a single rivet. The legs of the triangular section in each end are given a half twist below the curls, at the point indicated, and then fastened at the apex with a single rivet or bolt, after which the curls are pressed inward and riveted to the triangles at the point of contact.

Fig. 7 shows the completed humidor done in Japan black. The box on top, built to the dimensions given in Fig. 8, is fastened to the ironwork by means of four small screws, inserted through holes drilled in the top of each endpiece.

The stand lamp, which completes the unit shown in Fig. 1, is a piece equally easy to construct. The stem, in this project, is a 38-in. length of 1-in. square brass tubing. The actual ironwork which converts this tube into an attractive lamp begins with the shaping of the legs according to the diagram shown in Fig. 9. One length of 3/4 by 1/8-in. strap iron is used in making each pair of legs, the iron being half-notched at the point of crossing to form the loops and allow of a half-lapped joint, as shown in Fig. 10. The



the Home Craftsman

two legs are held together with a short piece of threaded brass tubing which is fitted through a hole drilled in the center of each pair and held in place with a square nut on either side. The nut used on the top side should be of such a size as to fit the long brass stem snugly. With this arrangement, the legs are held together, the brass stem is centrally anchored to the legs, and a passage for the wires is provided, all in one operation. The legs are fastened to the brass stem with small screws threaded into holes previously drilled and tapped in the sides. Long cane-shaped pieces of strap iron are fastened at one end with the same bolts, and fastened again in a similar manner at the top of the stem, as pictured in Fig. 11. The extreme top of the brass tube is cut to allow one side to be turned over, thus sealing the end. A hole is then drilled through the turned-over piece, into which is screwed a standard twin-socket light fixture, the wires extending down through the tube and out at the bottom, a trifle above the floor level.

The greatest care must be used in assembling these bent-iron pieces. Only through constant checking can pieces be constructed which will stand level and be perfectly symmetrical. To this end, it is advisable to do all preliminary assembling with small bolts, rather than insert the rivets as soon as each hole is drilled. Not until the piece is faired-up satisfactorily should the final fastenings be put in. Even at that late stage, be careful. In riveting, use many light blows instead of a few powerful ones. Working in this manner, you will not only get a cleaner job on each rivet, but you will greatly decrease the possibility of the piece being hammered out of shape.

The table shown in Fig. 2 is a neat little design which is somewhat different. The framework for this consists of a length of 5/8-in. strap iron, shaped to form a 12 by 17½-in. rectangle, with the corners bent at 45° to permit fastening of the four 1 by 17-in. legs, as shown in Fig. 12. Each of these is held in place with a single rivet, with the exception of the leg that conceals the joint in the top framework, where the fastenings should be two, as in Fig. 13.

Figs. 14 and 15 show the proper spacing for the diagonal braces and S-pieces

which go to make each face of the piece. Each brace is given a half twist at each end in order to make a flat-side-to-flat-side connection with the legs. Solder may be substituted for rivets in fastening the S-pieces into place between the diagonals, as shown in Fig. 16. A suitable top for the table can be constructed from a shallow galvanized pan in which are set colorful tile blocks in red and yellow squares, as shown in Fig. 17. The pan may be fastened to the frame with small angles and screws, using flat-head screws in the pan, countersunk flush.

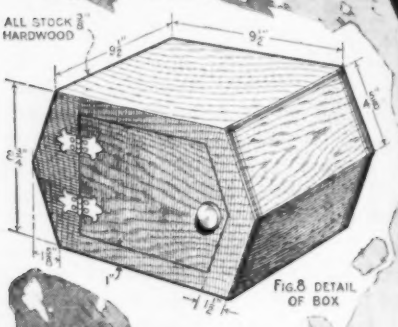


FIG. 8 DETAIL OF BOX

Getting into something a trifle heavier, the railing shown in Fig. 3 makes an excellent project. It is impossible, of course, to give the dimensions of this unit, since the angle and length of each particular set of steps will determine the angle and length of the railing. However, the general principles of construction can be applied equally well in any case. The top and bottom of the rail are made from ⅜ by ¾-in. iron stock, which is left perfectly straight with the exception of a sort of shepherd's crook, which is turned around a length of pipe at one end of each piece. Strips of ¼ by ¾-in. iron are spaced at 10-in. intervals along

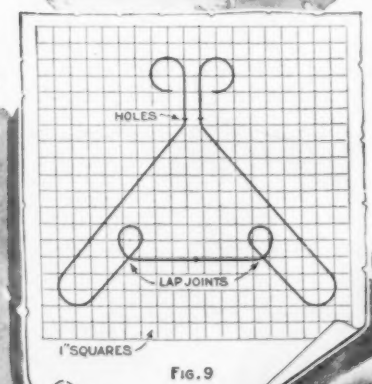
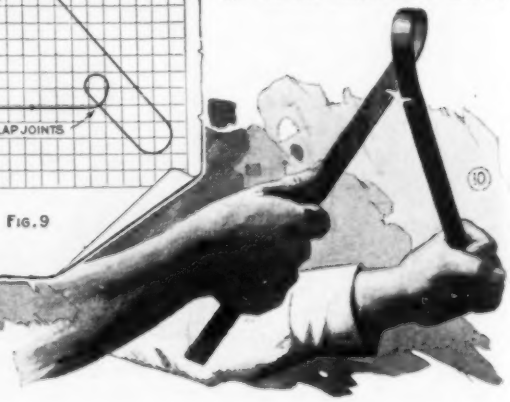


FIG. 9

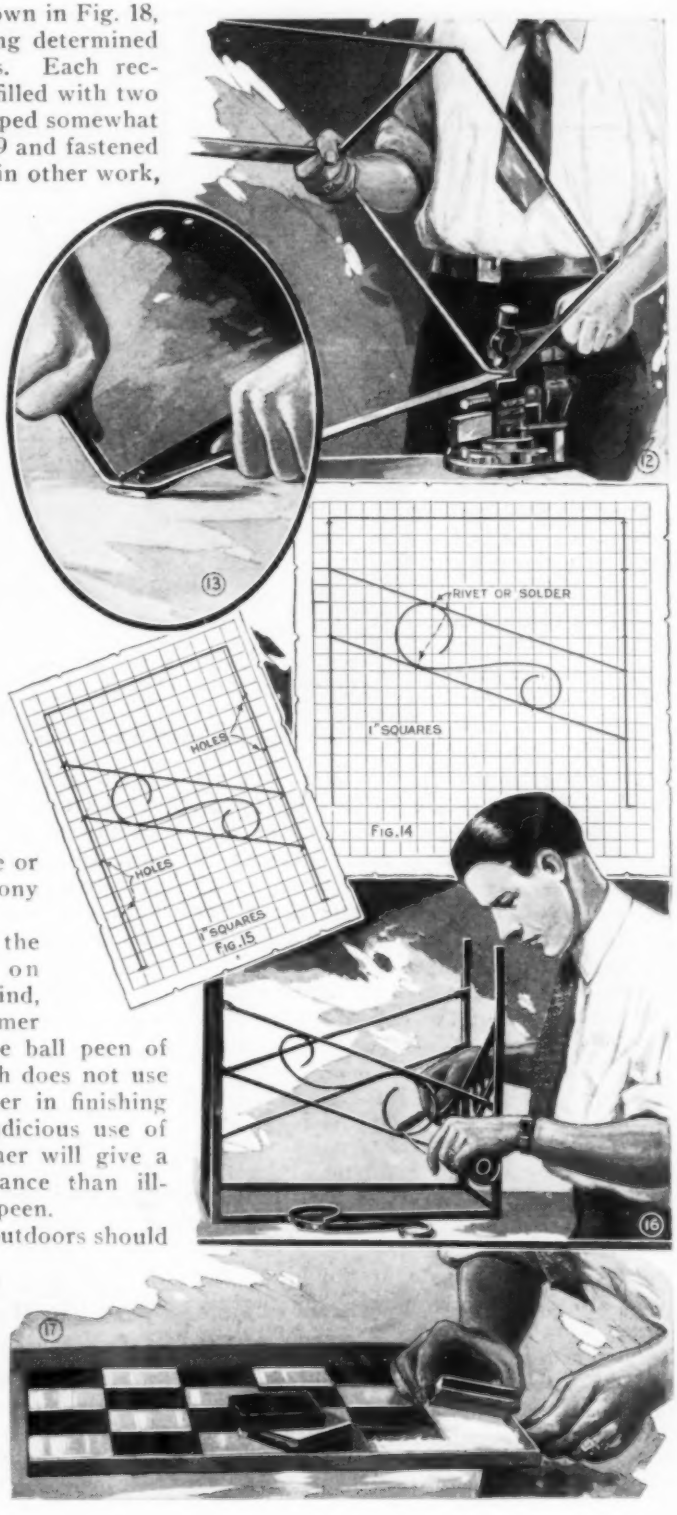


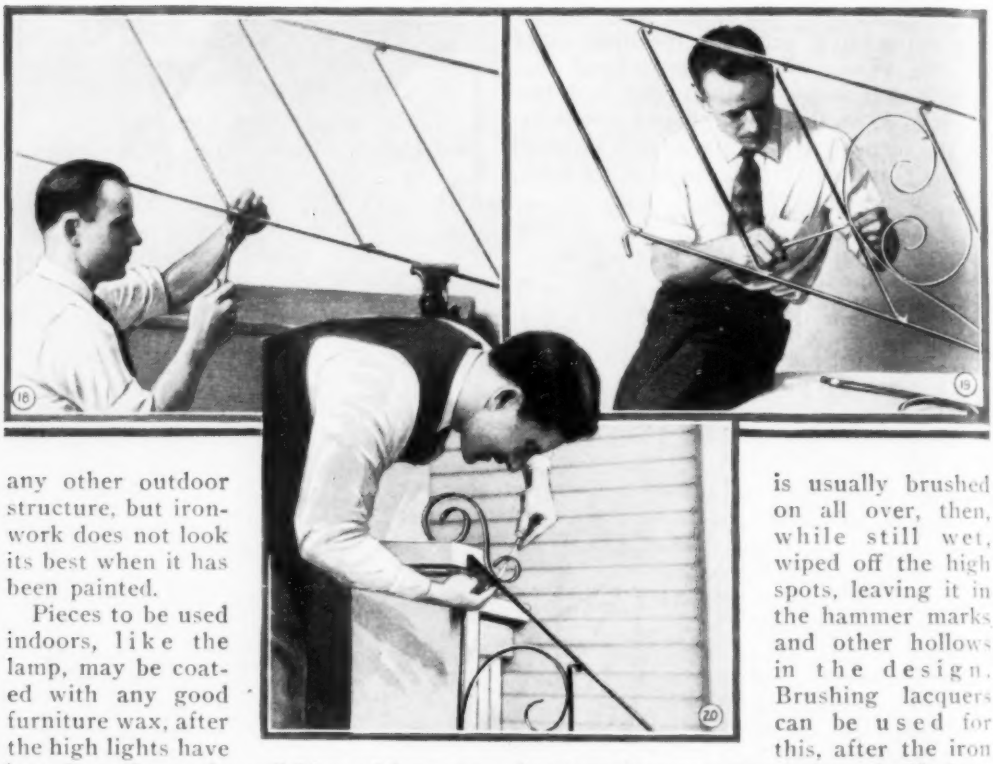
the length of the rail, as shown in Fig. 18, the turned-over angles being determined by the sweep of the steps. Each rectangle thus formed is then filled with two curls of ¾-in. flat stock, shaped somewhat to the form shown in Fig. 19 and fastened at the points indicated. As in other work, the preliminary fastenings should be bolts. Proper stays to hold the piece in position will be determined by the style of steps on which the railing is to be used. If on the flat-top post type, which seems to predominate, an S-curve should be used to bind the rail and post together, as in Fig. 20. This does not add any to the strength of the unit as a whole, but it does add greatly to the appearance of the piece, which otherwise would make the impression of being "sawed-off."

While this particular arrangement has been described as a step railing, it is obvious that the same design could be used successfully as a fence or as a straight porch or balcony railing.

Do not overemphasize the "hand-hammered" effect on bent-iron pieces of any kind, and especially do not hammer all over the piece with the ball peen of the hammer. A blacksmith does not use the ball end of his hammer in finishing real wrought work. A judicious use of the flat face of the hammer will give a far more realistic appearance than ill-considered use of the ball peen.

Work that is to be used outdoors should be coated with boiled linseed oil, which is rubbed on in a thin coat and allowed to dry just like paint. Several coats may be given at intervals, and these will effectively prevent the pieces from rusting. Of course, the work may be painted, just like





any other outdoor structure, but ironwork does not look its best when it has been painted.

Pieces to be used indoors, like the lamp, may be coated with any good furniture wax, after the high lights have been brought out by polishing with emery cloth. A good grade of lubricating oil (cylinder oil) may be used for the same purpose, rubbing the pieces first with an oily rag and then with a dry one. A rub or two of oil once a year will thereafter keep them in good condition.

Color should be used only sparingly, if at all, on large pieces, and then only on small portions of the design. The color is usually brushed on all over, then, while still wet, wiped off the high spots, leaving it in the hammer marks and other hollows in the design. Brushing lacquers can be used for this, after the iron has been hammered and cleaned. Various effects can be tried out on scrap pieces of the stock, and a finish selected that will suit the piece. Dropblack, ground in turpentine, can also be used as a wipe coat, rubbing it off with a rag slightly moistened with turpentine, and leaving just a trace of black in the hammer marks. A visit to the nearest antique store will suggest many finishes that can be imitated.

How to Straighten a Buckled Handsaw

Although handsaws should be handled so that they do not bend or kink, it is well to know how to restore a saw having such a defect. A saw remains kinked after being bent over forcefully because the metal on one side of the blade has been stretched, making this side slightly longer than the other. Holding the blade over a smooth surface and striking the raised portion therefore offers no remedy; in fact, usually makes the defect worse. The proper procedure is to cushion the blade on a film of water which is poured on the smooth, level surface of the piece used for an anvil. The saw blade is placed on the film of water with the buckled side up and a sharp blow with a hammer is then usually sufficient to straighten the blade.—Lemuel Harris, Nogales, Ariz.

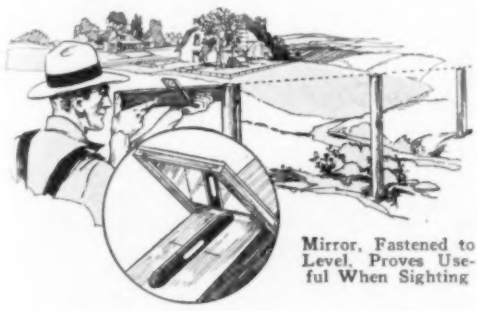
Tin-Can Lid Used as Reflector to Mark Width of Truck

Fastened to the lower left-hand corner of a truck bed, at the front, a large tin-can cover reflects an effective warning to approaching motorists as it shows them exactly how wide the truck is and thus helps to gauge the clearance necessary

when passing. Although a cover similarly attached at the back end of the truck will be helpful, the one at the front is really more important, as the brilliancy of the truck's headlights often prevents an approaching driver from seeing the truck body.—Horace Lemaster, Maryville, Mo.

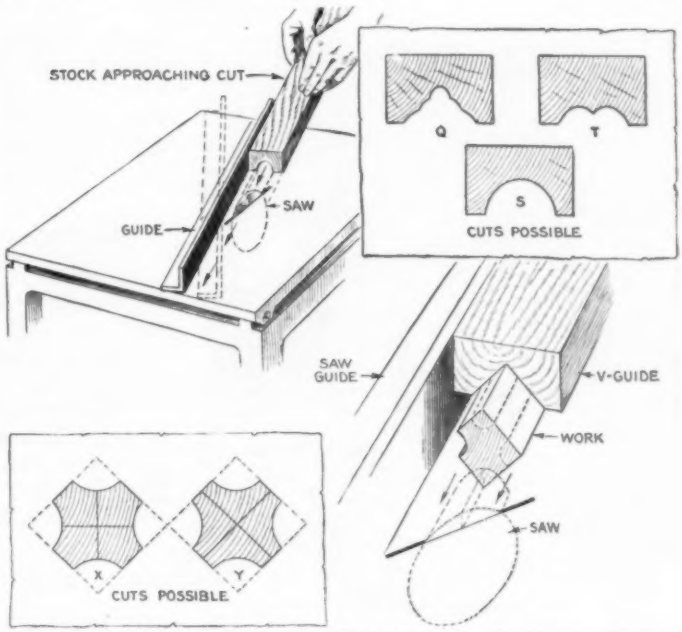
Mirror on Level for Correct Sighting

When sighting over the face of a level for any purpose, as, for instance, when setting fence posts, the user cannot tell whether he is holding the face perfectly level. In such cases, a small mirror will be found helpful as it enables the worker to see the level glass while he is sighting over the face. Construct a frame of light wood, letting two sides project a few inches at one end. The distance between the extending sides should be the same as the width of the level so that, when the projecting ends are pushed over the level as indicated, the mirror will be held in position firmly. Make a pencil mark on the side of the level to show the correct position of the mirror, which will eliminate the need of adjusting the mirror every time it is used. A small brad, driven into one or both of the extending pieces, on the inside, prevents the mirror from slipping



Mirror, Fastened to Level, Proves Useful When Sighting

down against the edge of the level and cutting off the line of sight.—Luther Strosnider, Onaga, Kans.

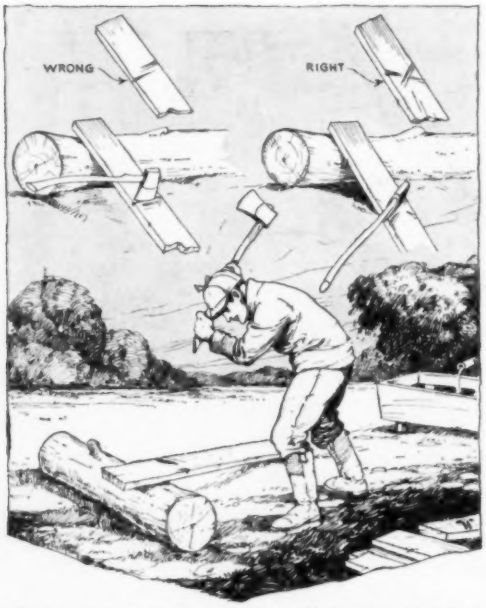


Angle-Iron Saw Fence, Attached to Table Obliquely, Enables the Operator to Cut Fancy Molding

Oblique Saw Cuts for Making Molding

Among the many odd cuts possible on the hand-feed ripsaw, none perhaps are so little known as those which can be made by using an oblique fence. In this kind of work the direction of feed is at an angle with the saw instead of parallel to it, and the particular angle at which the fence is set, and the height of the saw table, determine the width of the slot to be cut. Although some of the cuts shown in the illustration have been drawn with true circular arcs, in practice the cut is slightly elliptical. This irregularity, however, is usually so slight that it makes no difference. The guide or fence is screwed to the saw table at the angle which will give the desired width of cut, and the table is then raised so that a very light cut is taken. It is necessary to run the work through a number of times and each time the table must be lowered a trifle. To cut a groove at a corner of a piece of square stock, a V-guide, such as shown in the right-hand detail, must be used. For a fence, a length of angle iron will be found useful.—John E. Hyler, Peoria, Ill.

¶Use the smallest milling cutter possible —the cost is lower and less power needed.



Making Crossing Diagonal Cuts When Chopping Prevents Chips from Striking the Workman

Diagonal Cuts Prevent Flying Chips

When chopping up a board, every blow of the ax is apt to send a piece of wood flying against the worker. This danger is largely overcome by making the cuts in a crisscross fashion as shown in the drawing. Both the usual and the suggested methods of chopping are indicated in the upper details.—J. W. Bailey, Baltimore, Maryland.

Linoleum Scraps for Advertising Signs

Painting white signs on the sidewalk directly in front of their stores is the usual method employed by many storekeepers to advertise. Powdered chalk mixed with water makes a good sign for the purpose but soon wears off and must then be renewed. Permanent signs made with regular paint, are seldom desired. One Chicago merchant uses a better method for temporary signs. He got a number of cheap linoleum scraps, 2 to 3 ft. wide and 5 to 6 ft. long. On the reverse side the signs were painted and the scraps were laid out in front on the sidewalk. These signs last a surprisingly long time without repainting as the rough nap prevents the chalk from being scraped off. At night they can be taken in if desired. When the lettering is to be changed, the chalk is removed with water and a scrubbing brush. A set of these signs for periodic sales can be kept on hand ready for use, and thus save the storekeeper considerable time.—K. F. Keith, Chicago.

Making Power-Hacksaw Blades Last Longer

The teeth on a power-hacksaw blade wear out first at one end where all the cutting is done. By inserting a block between the work and the fixed jaw of the vise, an entirely new set of teeth are brought into action. When these teeth are worn out, the whole length of the blade is worn, and may then be scrapped. —L. Daniels, Seattle, Wash.

Pencil on Surface Gauge Marks Wood

The scriber of a surface gauge does not make a very distinct line on wood, and when I had a number of wooden blocks to mark off, I decided to use a pencil to make a line, thus saving the trouble of chalking the work. To use a surface gauge in this manner it is not necessary to make any new parts. Simply take out the spindle and insert the scriber in the clamp on the block; then use the pencil in the spindle hole of the scriber clamp as the photo shows.—Harry Moore, Hamilton, Can.

Using a Pencil in the Spindle Hole of a Scriber for Marking Wood

Attachment for Graflex Camera Enables Focusing without Opening It

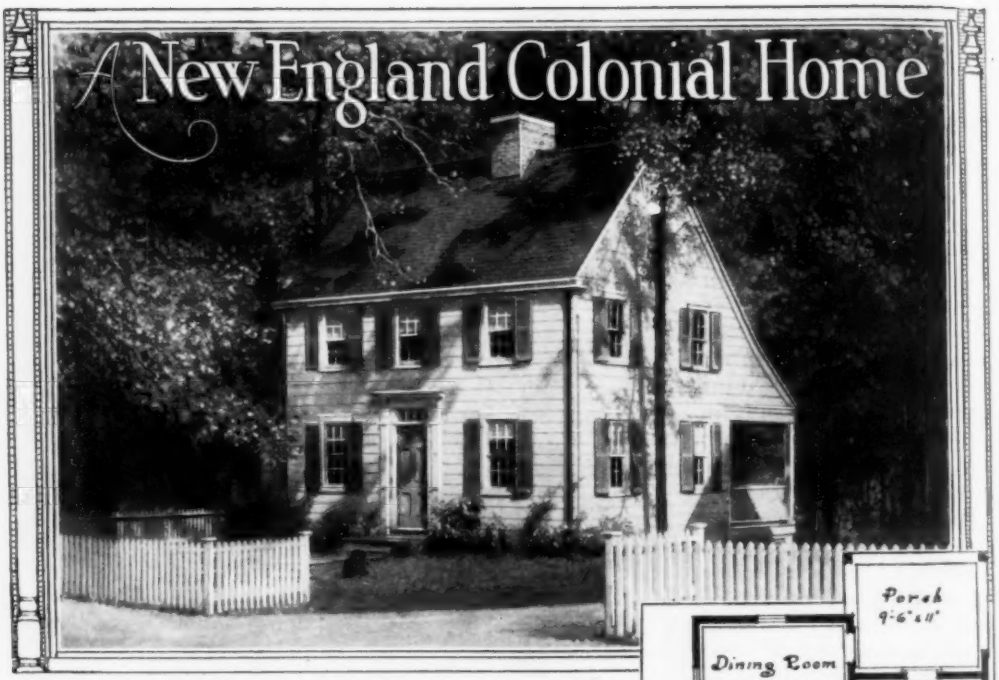
For use in places where a graflex camera cannot be opened, and the image brought into sharp relief in the usual way, the illustrated focusing attachment will be found helpful. It was devised by a western newspaper photographer who often had to resort to guessing the focus, especially when he was "kidnaping" shots of prominent persons in courtrooms and other public places, where the opening of the camera would attract too much attention and give the person or persons to be photographed a chance to "cover up." A steel ball and a small coil spring are placed inside a short piece of tubing, one end of which has been closed just enough to prevent the ball from coming out. The other end of the tube is soldered to a small brass plate, as shown in the detail, and two holes for screws are drilled through the plate. An ordinary bullet catch, to which a base plate is soldered, will serve equally well. A hole, which will just admit the tube, is drilled through the box of the camera at the point indicated. With the lens set at the correct focus for different desired distances, the drilling is continued, just enough to make small indentations at points on the rack arm. The attachment is then screwed to the side of the camera and is ready for use. When moving the lens forward or backward, the operator can feel the ball drop into the indentations, and knowing at which focus these are drilled, he can correctly ascertain just how far to move the lens to get the object in clear focus without opening the camera. No actual measurements can be given as these would vary according to the camera on which the attachment is used.—L. M. Curtis, Venice, Calif.

Attachment on Graflex Camera Permits User to Put It in Focus without the Trouble of Opening It

Rubbing Vellum Paper with Magnesia Makes Erasures Possible

When drawings are penciled on vellum, which is common practice especially in the field of tool designing, it is practically impossible to make erasures, as lines drawn sufficiently dark for blueprinting cannot be removed and therefore mistakes print equally well with the corrections. This trouble can readily be overcome with a cake of magnesia, obtainable at any drug store. Peel off the glue-paper wrapper from one end of the cake just far enough to expose the end of the cake. Rub the exposed end over the vellum paper on which a penciled drawing is to be made. No matter how hard the pencil is pressed in making the lines, it will be possible to erase them with ease so that they will not show up in the blueprint.—Frank L. Wade, Tampa, Fla.

A New England Colonial Home

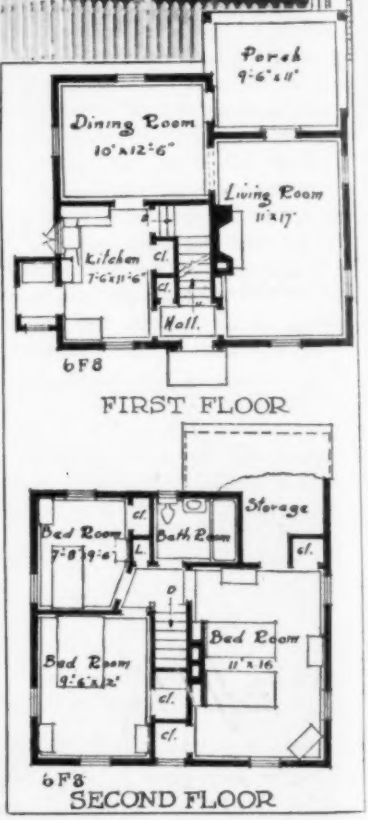


© The Architects' Small House Service Bureau, Inc. Plan No. 6-F-8

PLANS for small homes come and go—most of them go. But a first-rate Colonial house design is as stable in market value as anyone can build. Thus we understand why architects and builders recommend it. Take any street of small homes—the house that catches your eye and gives you most lasting pleasure is the finely finished Colonial house. That is the reason resale values stand up.

There are plenty of jazz houses. Most of us are tired of them. It is certain also that most of them cost more than they should. The "dancing architecture" is not cheap. Now this house, you can see, is straightforward; no furbelows, no added ornament to take money out of your pocket or to increase the mortgage. It will be inexpensive to own and to run, a friendly house. And it has real beauty.

The plan has the arrangement most people want, and it has been designed with expert care to bring in all the little things that loom so large in carefree housekeeping. You do not walk through the whole house to get from kitchen to front door. The dining room opens on your garden. The location of the fireplace conserves materials and heat, also reduces the cost of installing your house heater.



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